

DSO 522: Applied Time Series Analysis for Forecasting Fall Semester, 2022

Instructor: Inga Maslova

Office: ACC 203

Email: DSO522.f20@gmail.com

Web Page: Blackboard

Schedule: MW 11:00 am – 12:20 am JFF 414

Office Hours: [M 9:00 am - 10:00 am on Zoom](#), other times available by appointment (click [here](#) to schedule)

Prerequisites: GSBA 506ab or GSBA 524 or (GSBA 516 and GSBA 545) or any equivalent applied business statistics 3-unit course. If you are concerned about your preparation, please reach out to me.

Course Description: Today, successful firms compete and win based on analytics. If you are wondering about how to take advantage of predictive analytics, data science, and big data, this is the course for you! This course covers topics in time series analysis. These are time series regression, decomposition methods, exponential smoothing, and the Box-Jenkins forecasting methodology to name a few. Forecasting is not an armchair activity, nor is it an exercise in mathematical formalism, a one-click-and-you're done computer project, or an uncritical appeal to past experience. Rather, the modern forecaster must be a creative thinker who is able to use available information wisely, draw on the experience of others, use technical arguments when needed and, finally create a computer-based forecasting system that allows management to plan effectively. Probably no such paragon exists, but we should at least aim for an appreciation of all these skills and the ability to work in a team to achieve success. Virtually every area of business makes use of some type of forecast. For example:

1. Marketing managers use a sales forecast to establish promotional budgets.
2. Accountants rely on forecasts of costs and revenue in tax planning.
3. Financial experts must forecast cash flows to maintain solvency.
4. The personal department depends on forecasts as it plans recruitment of new employees and other changes in the workforce.
5. Production managers rely on forecasts to determine raw-material needs and the desired inventory of finished products.

This course is intended for students working in the field of economics, business, marketing, production, operations research, international trade, accounting, etc., who want a non-technical introduction to applied time series econometrics and forecasting.

Learning Objectives: In business forecasting, time series models are used to analyze data that are collected sequentially over time. A primary goal of these models is to exploit the association structure of the observations in order to predict future values. Topics to be covered include the concept of stationarity, autoregressive and moving average models, identification and estimation of models, prediction and assessment of model forecast, seasonal models, and intervention analysis. The course goals are for each student to understand time series methods and obtain “hands on” experience using, analyzing, and developing forecasting models for business applications.

Student Learning Outcomes: At the end of the course, the student will be able to

1. Analyze any time series data using various statistical approaches
2. Generate reasonable forecast values
3. Make concise decisions based on forecasts obtained

Textbook:

1. Time Series Analysis and Its Applications, R. H. Shumway and D. S. Stoffer, Springer, 4th edition. PDF of the book is available online.

2. Forecasting: Principles and Practice, by Rob J Hyndman and George Athanasopoulos, 2019
The textbook is available on <https://otexts.com/fpp3/>

3. *Suggested*. Practical Time Series Forecasting with R: A Hands-On Guide, 2nd Ed. by Galit Shmueli and Kenneth C. Lichtendahl Jr., 2016. Textbook website: <http://www.forecastingbook.com/>

Course topics: This course covers the following topics: pre-processing, characterization, and visualizing time series, model performance evaluation, smoothing methods, regression models, Box-Jenkins models, seasonal ARIMA models, and models with categorical outcome.

Grades: Grades will be based on pre-class assignments, in-class participation, homework assignments, in-class labs, a midterm exam, a paper summary, and a final team project. The weights for each are given in the table below.

Deliverable		Grade contribution
Pre-class	Before class (11:00 am PST)	10 %
In-class	End of the day (11:59 pm PST)	10 %
HW	1 week after it is assigned	15 %
Labs	End of the day (11:59 pm PST)	20 %
Midterm	October 12, 2022 11:59 pm PST	20 %
Final project	December 7, 2022 1:00 pm PST	25%

Final grades represent how you perform in the class relative to other students. Historically, the average grade for this class is about a (B+/A-). Three items are considered when assigning final grades:

1. Your average weighted score based on the percentages given in the table above.
2. The overall average percentage score within the class.
3. Your ranking among all students in the class.

Pre-Class Assignments: Preparation for lectures is an extremely important part of the learning experience in this course as the richness of the learning experience will be largely dependent upon the degree of preparation by all students prior to class sessions. Throughout the semester there will be short pre-class assignments based on readings and videos. These assignments will be due before the class, i.e. 10:00 am PST. There will be 50% score deduction for pre-class assignments submitted after the deadline and 10% deduction for each additional business day it is late. They will usually require you to watch a short video, read some material, etc., and answer the follow-up questions. All of it will be posted on Blackboard. Some of the questions will be graded on completion and some will be graded on accuracy. Please read the instructions on Blackboard carefully.

In-class Participation: During class you will complete examples shown by the instructor and submit your work on Blackboard. It will be due by the end of the day (11:59 pm PST) the day it was assigned. There will be 50% score deduction for in-class assignments submitted after the deadline and 10% deduction for each additional business day it is late.

Homework: There are three (3) homework assignments in this course, each is due 1 week after it is assigned. The purpose of the written homework in this course is to develop skills in understanding and

communicating the ideas of time series forecasting. Homework assignments will require you to submit all or parts of the code of your analysis, provide interpretation, suggest actionable recommendations. All of it should be typed neatly with necessary computer output and graphics placed in order with each corresponding homework exercise. Figures (including fonts) should be clear and readable. You are welcome to discuss homework problems with the instructor and other students in the class but all work turned in should be your own and reflect your understanding of the material. Direct copying of assignments or solutions will not be tolerated! All homework will be due at the end of the day (11:59 pm PST) on the due date. All assignments will be posted and submitted on Blackboard. The grade for the homework will be reduced by 10% for every working day it is late after that, to a minimum of 30% of the original grade.

Labs: There will be weekly in-class labs during the semester usually taking place on Wednesdays. The goal of these labs is to give you an opportunity to practice the material covered while being able to ask questions. These will generally require some computer work and a write-up. Labs will be posted and turned-in on Blackboard. They will be due by the end of the day (11:59 pm PST) the day assigned. The grade for the lab will be reduced by 10% for every day it is late.

Midterm: There will be one take-home midterm exam on **October 12, 2022**. The test will be timed. The test can't be retaken.

Final Project: At the end of the semester, you will work on the final course project. This will consist of an analysis of a business case of your choice. You will work in small groups of 4 people to conduct this project. You can choose a case of personal interest or importance, and analyze it using the techniques discussed in class. Start searching for teammates and the business case for your project right away. The final project will consist of the following steps:

1. Choose teammates by October 20, 2022.
2. Submit the one-page project proposal, one per team. Due on October 26, 2022.
3. Submit the recording of your team presentation for an assigned target audience. Each team member must be presenting in that recording to get credit for the project. Due November 30, 2022 11:59 pm PST
4. Submit the project write-up with all supporting material. Due December 7, 2022 1:00 pm PST.
5. Submit individual report about your own and your teammates contribution to the projects. Due December 7, 2022 1:00 pm PST.

Software: We will use R and RStudio during this course. This software is free and can be downloaded at <http://www.r-project.org> and <https://www.rstudio.com/>

Academic Conduct:

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on [Research and Scholarship Misconduct](#).

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. The Office of Student Accessibility Services (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed

the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Support Systems:

Counseling and Mental Health - (213) 740-9355 – 24/7 on call
studenthealth.usc.edu/counseling

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

National Suicide Prevention Lifeline - 1 (800) 273-8255 – 24/7 on call
suicidepreventionlifeline.org

Free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.

Relationship and Sexual Violence Prevention Services (RSVP) - (213) 740-9355(WELL), press "0" after hours – 24/7 on call
studenthealth.usc.edu/sexual-assault

Free and confidential therapy services, workshops, and training for situations related to gender-based harm.

Office for Equity, Equal Opportunity, and Title IX (EEO-TIX) - (213) 740-5086
eeotix.usc.edu

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

Reporting Incidents of Bias or Harassment - (213) 740-5086 or (213) 821-8298
usc-advocate.symplicity.com/care_report

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

The Office of Student Accessibility Services (OSAS) - (213) 740-0776
osas.usc.edu

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

USC Campus Support and Intervention - (213) 821-4710
campussupport.usc.edu

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

Diversity, Equity and Inclusion - (213) 740-2101

diversity.usc.edu

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

USC Emergency - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

dps.usc.edu, emergency.usc.edu

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

USC Department of Public Safety - UPC: (213) 740-6000, HSC: (323) 442-120 – 24/7 on call

dps.usc.edu

Non-emergency assistance or information.

Office of the Ombuds - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

ombuds.usc.edu

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

Occupational Therapy Faculty Practice - (323) 442-3340 or otfp@med.usc.edu

chan.usc.edu/otfp

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.