

STAT 443 Time Series and Forecasting

Course Syllabus

Calendar Description

- Trend and seasonality, autocorrelation, stationarity, stochastic models, exponential smoothing, Holt-Winters methods, Box-Jenkins approach, frequency domain analysis.
- Prerequisite: One of MATH 302, MATH 318, STAT 302 and one of STAT 200, STAT 241, STAT 251, STAT 300, BIOL 300, COMM 291, ECON 325, ECON 327, FRST 231, POLI 380, PSYC 218, PSYC 278, PSYC 366.
- Corequisite: STAT 305.

Contact Information

- Natalia Nolde (natalia@stat.ubc.ca)
- Office hours: TBA
- Course-related communication through Piazza online forum.

Course Learning Outcomes

On completing the course, students should be able to demonstrate an understanding of the techniques and applications of well-known ideas in time series such as autocorrelation, stochastic models (including the ARIMA and GARCH families), popular forecasting methods and spectral analysis for univariate time series.

Teaching Methods

In most lecture sessions, an in-class activity followed by peer discussion, iClicker questions and canvas quiz questions will replace at least part of the lecture component. The in-class activities created for the course are useful tools to enhance student learning, and, as research shows, are far more effective than even the most polished traditional lectures on the same topics. Weekly labs are designed to provide students with additional insights into time series concepts introduced in class as well as to teach how to implement time series data analyses using open-source software R.

Course Activities and Assessment

- Written assignments: 10% (4 × 2.5% each)
- On-line WeBWorK homework: 5%
- Labs: 5%
- In-class work (iClicker questions and canvas quizzes based on in-class activities): 5%
- Mid-term: 25%
- Final exam: 50% (you must pass the final exam to pass the course)

The usual university rules for extenuating circumstances and plagiarism apply.

Course Content

Chapter 1: Exploratory techniques in time series analysis

Chapter 2: Stochastic models for time series

Chapter 3: Estimation and model fitting for time series

Chapter 4: Prediction for time series

Chapter 5: An introduction to the frequency domain

Chapter 6: Inference in the frequency domain

Chapter 7: Bivariate Processes (time permitting)

Chapter 8: Models for changing variance: GARCH processes

References

Recommended textbook: C. Chatfield and H. Xing (2019): The Analysis of Time Series: An Introduction with R (7th edition). Chapman & Hall/CRC.

Course Policies

- Assignments are to be submitted online via file upload on canvas. Late assignments will incur a 1% per hour penalty.
- There will be no make-up exam. Students who have legitimate reasons for missing the midterm exam will have the weight transferred to the final exam. For the case of the final exam, students will need to apply for standing deferral through their faculty office and write the deferred final in the next offering of the course or during the official deferred exam period coordinated by Enrolment Services.
- Assignment and exam remark requests need to be made in writing within one week of the return of the marked work.

Academic Integrity

All students are expected to follow UBC's Academic Honesty and Standards policy (<https://www.calendar.ubc.ca/vancouver/index.cfm?tree=3,286,0,0#15620>). We encourage students to discuss their work in solving the problems. However, you must write up your own solutions independently. This is not a group assignment, so we do not expect students to have similar writeup. Plagiarism is an academic offence and will be dealt with accordingly. Students must correctly cite references if you quote or use outside sources in your work. Breach of the academic integrity policy may, at a minimum, result in a grade of 0 on the relevant assessment or may result in more serious consequences.

Please see UBC's Academic Calendar for detailed policies on Academic Misconduct: <http://calendar.ubc.ca/vancouver/index.cfm?tree=3,54,111,0>

University Policies

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available here: <https://senate.ubc.ca/policies-resources-support-student-success/>.

Weather Contingency Plan for Class Sessions and Exams

In-person, on campus activities may need to be cancelled due to issues such as weather conditions (e.g., snow). The most up-to-date information about cancellations will be posted on ubc.ca. Please check ubc.ca often during times when an extreme weather event could disrupt our course activities. If in-person classes or exams are cancelled, the following contingency plans will take effect. The uncertainty that comes with extreme weather events can be stressful. Rest assured I will be flexible with assignment deadlines and communicate with you as early as I can. I will try to communicate with you about weather-related class cancellations through Canvas announcements. Here is what you can expect in the event an in-person class session, quiz, or exam is cancelled:

In case in-person classes are cancelled due to weather: If in-person activities are cancelled due to weather or other environmental conditions, class and labs will be held online. The Zoom link will be posted on Canvas. For those unable to participate in an online class on short notice, I will provide a lecture recording that is posted to Canvas.

If weather impacts the midterm, we will reschedule: Please see Canvas for rescheduling notifications. It is likely the midterm will take place at the next class session.

If you are registered to write exams at the Centre for Accessibility, I encourage you to reach out to your CFA advisor well in advance to discuss the weather contingency plan for this course.

If you have any questions or concerns about this weather contingency plan, please come talk to me. Discussing any issues prior to the cancellation is helpful so we can work out a plan in advance.