

STA457H1/STA2202HF L5101 – Time Series Analysis

Fall 2019

Instructor: Alex Shipilov	Time: Tue: 6:00 pm – 9:00 pm (Lectures);
TAs: TBD	
Email: alex.shipilov@utoronto.ca	Place: OI G162

Objectives & Tentative Course Outline: Welcome to STA457H1/STA2202HF! The main goal of the course is to provide an overview of methods and problems in the analysis of time series data with a primary application in the financial industry and capital markets. The order in which topics are covered will be roughly as follows:

1. Basic finance concepts
2. Explanatory Data Visualization and Analysis: histograms, quantiles, boxplots, transformations
3. Univariate Distributions, Multivariate Time Series and Bootstrapping: Parsimony, Parameters, Moments, MLE, Transformations
4. Processes and Time Series Models: stationary stochastic processes, autoregressive (ARMA, ARIMA), moving average, unit roots testing, seasonal adjustments, and forecasting
5. Spectral Analysis, nonparametric and parametric spectral estimation
6. Additional Topics (as time permits): ARCH and GARCH models, spurious correlation and cointegration, regression models with autocorrelated errors, signal estimation.

Office Hours and Location: Room 388, 55 College St., Public Health Sciences Building on Thursdays from 3pm to 5pm, or by appointment. Do not hesitate to contact me by e-mail as many problems you might encounter can be easily resolved this way.

Prerequisites: STA302H (or equivalent) is listed in the calendar as a prerequisite for STA457H1F. If you do not have this prerequisite, you should see the undergraduate coordinator in the Department of Statistical Sciences to obtain a waiver form. Graduate students enrolled in STA2202HF are exempt from this prerequisite but should be familiar with regression analysis before taking this course.

Recommended Textbook: *Statistics and Data Analysis for Financial Engineering: with R examples*, 2nd Edition, David Ruppert and David S. Matteson, Springer Texts in Statistics, 2015. This book is available at the University of Toronto Bookstore and is also available for free download from Springerlink:

<https://search.library.utoronto.ca/details?10133858&uuid=9d6b79cc-10c3-41b3-b6b8-9b27b5f1bfd6>

The textbook will be supplemented by handouts, which will be available on Quercus. The following books are also good references for this course and available for free download:

- *Introduction to Time Series and Forecasting*, 3rd Edition, P. Brockwell and R. Davis, Springer Texts in Statistics, 2016
<https://search.library.utoronto.ca/details?10608874&uuid=2ea4aac8-dcb8-4645-8b43-b0abeff5b228>
- *Time Series Analysis and Its Applications: With R Examples*, 4th Edition, R. Shumway and D. Stoffer, Springer Texts in Statistics, 2017
<https://search.library.utoronto.ca/details?11463019&uuid=4cebdec-b577-42e2-9476-a6a2509c3291>

Computing: We will use the software package R extensively in this course both for data analysis as well as some numerical computation. R is free software and can be downloaded (for Windows, Mac, and Linux operating systems) from <http://cran.utstat.utoronto.ca/>. Of interest to many of you will be RStudio, which provides a very nice environment for using R; information on RStudio (including downloads) can be found at www.rstudio.com.

A useful book that gives a good introduction to R programming is

A First Course in Statistical Programming with R by Braun and Murdoch, 2nd Ed, Cambridge University Press

The textbook for this course also provides a lot of examples of R code as will the handouts for the course.

Grading Scheme: The main emphasis of the course will be the application of time series methods; however, a solid knowledge of some basic statistical theory is also necessary to understanding the rationale behind the methodology. The course grade will be made up of 3 parts: homework assignments (20%), midterm exam (30%) and a final exam (50%).

- Homework assignments will involve both data analysis and theory problems. One assignment will be handed in before the midterm and two after. The lowest mark will be dropped.
- The midterm exam is scheduled for Tuesday October 15th. If this exam is missed due to illness or any other circumstances (with appropriate documentation), the weight from the midterm will be carried over to the final exam.
- The final exam will be held during the December exam period at a date and time to be announced later.

Important Dates:

Problem Set #1.....	October 2, 2019
Problem Set #2.....	October 30, 2019
Problem Set #3.....	November 26, 2019
Midterm	October 15, 2019
Final Exam	TBD

Late Policy: Homework assignments should be submitted via Quercus with a single PDF file by 9pm on the day of the deadline. A late penalty with 20% deduction per day after missing deadline will be applied. If you have any questions about this, please feel free to ask me.

Academic Honesty: Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto Code of Behavior on Academic Matters

(<http://www.governingcouncil.utoronto.ca/Assets/Governing+Council+Digital+Assets/Policies/PDF/ppjun011995.pdf>)

outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If students have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, they are expected to seek out additional information on academic integrity from their instructors or from other institutional resources.