University of Toronto
TIME SERIES ANALYSIS *STA457H1*
COURSE OUTLINE (2019 Winter)

Instructor: Jen-Wen Lin, PhD, CFA
Office Hours: *15 min Before and 45 min After Class + By appointment + Special sessions (to announce on Quercus)*
Class Time/Place: *Thursday 0300-0600 pm/ AH100*
Email: jenwen@utstat.toronto.edu
Teaching assistants:
1. *Guo, Yang Guan, Jian, ygj.guo@mail.utoronto.ca (Final exam)*
2. *Bian, Yuan, yuan.bian@mail.utoronto.ca (Assignment 1)*
3. *Bilodeau, Blair L., blair.bilodeau@mail.utoronto.ca (Assignment 2)*
- *Please check announcements on Quercus regularly for any updates on Course Outline*

COURSE DESCRIPTION

This course introduces time series analysis with applications in finance and investments. The techniques learned in this course can also be applied to other disciplines. After finishing this course, students are expected to gain hands-on knowledge on how to analyze and model time series data. Topics in this course include fundamental concepts of time series, Box-Jenkins methods (ARIMA models), multivariate time series analysis (transfer function model, Vector autoregression, co-integration), and applications of machine learning techniques in time series analysis, such as bagging and boosting for forecasting time series.

TA OFFICE HOURS

- **Assignments**
    1) Time series momentum strategy (<u>due on Feb-24</u>)
        - TA (*Bian, Yuan*) will hold TWO 3-hr sessions on week 6/7
    2) Smart beta strategy (macro factor construction, <u>due on 05-Apr</u>)
        - TA (*Bilodeau, Blair L.*) will hold TWO 3-hr sessions on week 12/13
- **Final exam preparation**
    1) TA (*Guo, Yang Guan*) will hold TWO 90 minutes TA sessions each week from week 10 to 13
    2) Practice questions are available for your preparation of the final exam.
- Times and locations of office hours to be announced on Quercus later.

WEIGHTING SCHEME

Marking Scheme:

**28% x Team-assignment-1+28% x Team-assignment-2
+ 38% x Final+6%x Participation**

- Team assignment (two students) and submit to Quercus
- Late penalty (20% deduction per day after missing deadline)
- Participation will be measured with attendance and class participation
- Please read and obey <u>academic integrity</u> at University of Toronto
  (<u>www.artsci.utoronto.ca/osai/students</u>), or see page 3 of Course Outline

TOPICS AND SCHEDULE

# of week	Date	Schedule (Tentative)	
1	10-Jan	Fundamental concepts	
2	17-Jan	Fundamental concepts and ARMA model	
3	24-Jan	ARMA model	
4	31-Jan	ARIMA model and unit root test	
5	07-Feb	Cath-up or Assignment 1 explained	Assignment 1 available
6	14-Feb	Transfer function noise model and intervention analysis	
7	21-Feb	Reading Week	
8	28-Feb	Multivariate time series	
9	07-Mar	Multivariate time series	
10	14-Mar	Bootstrapping and bagging time series	Last day to drop course 17-Mar
11	21-Mar	Catch-up or Assignment 2 explained	Assignment 2 available
12	28-Mar	Selective topics and catch-up	
13	04-Apr	Graduate student presentation	

- <u>Selective topics</u>
    1) MIDAS regression and nowcasting using Google trends
    2) Forecasting and boosting time series model
    3) Neural network for time series and Kalman filtering

TEXTBOOK (OPTIONAL)

Wei (2005), Time Series Analysis—Univariate and Multivariate Methods.
https://search.library.utoronto.ca/details?5587975&uuid=be2c9580-3b87-4133-897a-04dac9884666

ACADEMIC INTEGRITY

All students, faculty and staff are expected to follow the University's guidelines and policies on academic integrity. For students, this means following the standards of academic honesty when writing assignments, collaborating with fellow students, and writing tests and exams. Ensure that the work you submit for grading represents your own honest efforts. Plagiarism—representing someone else's work as your own or submitting work that you have previously submitted for marks in another class or program—is a serious offence that can result in sanctions. Speak to me or your TA for advice on anything that you find unclear. To learn more about how to cite and use source material appropriately and for other writing support, see the U of T writing support website at http://www.writing.utoronto.ca. Consult the Code of Behaviour on Academic Matters for a complete outline of the University's policy and expectations. For more information, please see http://www.artsci.utoronto.ca/osai and http://academicintegrity.utoronto.ca.