ADS 523
Time Series
COURSE SYLLABUS
(2022-2023, Fall Semester)
Time Series

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Textbook: An Introduction to Analysis of Financial Data with R, Ruey S. Tsay

References:

1. For having fun, reviewing easy concepts and hands on experience: Introduction to Time Series Forecasting with Python (Jason Brownlee, The machine learning mastery guy)

2. For probability and statistics: Probability & Statistics for Engineers & Scientists 9th Edition Walpole et al.

Prerequisite: To be acquainted with simple probability concepts, in addition to some maturity in Python.

Goals: This course is designed to introduce the basics of time series.

ATTENDANCE POLICY: Attendance is not mandatory in this course, though attendance may be done by head counting.
Grading Policy: There will be assignments each worth 10%, there will be a final exam that is worth 50%.

Some Notes:

1. **We will be dealing with not just Financial Data. We will be using real data sets and look for solutions for real problems (You will then be able to see if you can handle fancy things like prediction of Bitcoin prices on your own!)**
2. **Python will be the main language to be used. We will keep the lecture as independent as possible from the language. You can use R (even fortran) in your own analyses as well, however assignments will be submitted in Python.**
3. **Main goal will be forecasting and describing the data under consideration.**
4. **Though hands-on experience with time series data will be an important goal of this course, understanding the concepts of time series will be another important goal of this course.**
5. **HW's will be given on a regular basis and will be submitted through e-mail or moodle.**
6. **Programming exercises will be done in (goog co) labs or Jupyter, so you better install conda beforehand.**
7. **Lecture material (such as: Jupyter Notebooks, colab stuff) will be publicized on Github or on Moodle.**
8. **Time permits and depending on our pace, we will be talking about more recent topics.**

COURSE CHART

WEEK		Course Topics	
1		Introduction to Python (Some basic packages and visualization techniques, and syntax) – Some Probability Concepts	
2		Review of Probability Concepts A crash course on Python: statistical tools and important packages such as numpy, scipy, pandas and statsmodels,	HW1
3		Linear Models: Stationarity, Correlation and Autocorrelation Function, White Noise	
4		Simple Linear Models: AR(q), MA(q)	
5		Linear Models: MA(q)	HW2
6		Linear Models: ARMA	
7		Unit Root – Random Walks – Nonstationarity	HW3
8		ARIMA	
9		ARIMA – cont'd	HW4
10		Case Studies	
11		Asset Volatility and Volatility Models	
12		Asset Volatility and Volatility Models - Cont'd	HW5
13		Kalman Filter	
14		Final Exam	HW_Final_Boss