

<b>Credits:</b>	3 undergraduate hours
<b>Semester:</b>	Spring 2023
<b>Meeting Times &amp; Location:</b>	Tuesday & Thursday 9:30 – 10:50 am @ DKH 123
<b>Instructor:</b>	Shihan Xie
<b>Email:</b>	shihanx@illinois.edu
<b>Office Hours:</b>	Tuesdays 3:30 – 4:30 pm @ DKH 225C, or by appointment
<b>TA:</b>	Hyunji Song
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<b>Office Hours:</b>	Mondays 2:00 – 3:00 pm @ DKH 15

### Course Description

This course provides an overview of modern, quantitative, statistical and econometric methods for forecasting and evaluating forecasts. Topics include linear regressions; modeling and forecasting trend and seasonality; characterizing and forecasting cycles; MA, AR, and ARMA models; forecasting with regressions; evaluating and combining forecasts; unit roots; stochastic trends; ARIMA models; and smoothing. Advanced topics such as volatility measurement, modeling, and forecasting will be covered if time permits. Students will be required to write code in python for forecasting.

*Objectives:* Understand how to build and evaluate statistical models to forecast economic variables, including trends, seasonality, cycles, and volatility. Gain experience of implementing forecasts through coding.

### Prerequisites

Students are assumed to have taken ECON202, ECON203 (Economic Statistics 1 and 2) or equivalent statistics and econometrics courses. Knowledge about basic calculus is also required. Prior knowledge about Python is not required but some basic knowledge about programming will be useful for this class.

### Learning Resources

Lecture notes, sample codes, and problem sets will be distributed through *Canvas*.

#### *Textbook:*

Diebold, *Forecasting in Economics, Business, Finance and Beyond*.

Students can access it at <http://www.ssc.upenn.edu/~fdiebold/Textbooks.html>, the author's website for free.

#### *Statistical software:*

You need to use computer software to do forecasting based on simulated and actual data. The software we will use in class is Python, which has packaged statistical and econometric tools we need for forecasting. You can

use Python *for free* at several different platforms. *Google Colaboratory* is an online platform that allows you to write and execute Python in your browser. Another option is to install Anaconda which provides a user-friendly way to perform Python through Jupiter notebook.

Sample codes and datasets for this course will be posted here: <https://github.com/shihanxie/Econ475>

**Important Dates:** See *COURSE SCHEDULE* on next page

## Student Assessment

Problem sets	20%
Project	20%
Midterm exams	30%
Final exam	30%

## Grading

This class uses a plus/minus grading system. Letter grades will be assigned only at the end of semester based on the overall score and class average. This is a guideline. If needed, grades will be curved to make sure that the class average gets at least a B.

*Plus/Minus Grade Cutoffs:*

A+ ≥ 97	B+ ≥ 87	C+ ≥ 77	D+ ≥ 67	60 > F
97 > A ≥ 94	87 > B ≥ 84	77 > C ≥ 74	67 > D ≥ 64	
94 > A- ≥ 90	84 > B- ≥ 80	74 > C- ≥ 70	64 > D- ≥ 60	

## Course Policies

**Email Policy:** Please include [Econ 475] at the beginning of the subject line when emailing the instructor about this course. The instructor will not reply to emails inquiries requesting basic course information that can be easily found on this syllabus or Canvas.

**Office Hour Policy:** To attend the instructor's office hours, please reserve your slot via Course Calendar on Canvas. Extra slots will be posted if the existing ones are fully-booked.

**Assignment Policy:** There will be five problem sets and one python project. Only the best four out of the five problem sets will be counted toward the final grade (the problem set portion of your grade will be the average of all your problem set scores with the lowest grade dropped). Late assignments will not be accepted.

**Exam Policy:** There will be two in class midterm exams and one final exam. Exam dates and times are not flexible. In the event that a student misses an exam, the instructor reserves the right to give the student a zero on that exam. There will be no make-up exams except per university policy. The only exception to this rule is a death in the family or illness requiring immediate attention from a physician. See Article 1 - Student Rights and Responsibilities (for more details on these issues at: <https://studentcode.illinois.edu/article1/> ). The final exam conflict policy of the University will be enforced. The University's final exam policy is available at: <https://studentcode.illinois.edu/article3/part2/3-201/>.

The following materials are allowed for use during the exam: graphing calculator, accounting calculator or four-function calculator. No books, notes, papers, or other documents are allowed while exams are being taken. Cell-phones or other items that connect to the Internet are also forbidden. Students found to be using unapproved items are in violation of the Academic Integrity policy of the University and will be subject to disciplinary action.

## Course Schedule (subject to change with advance notice)

Week	Date	Topic	Assignments
1	01/17	Introduction	
	01/19	Review of probability and statistics	
2	01/24	Review of regression	
	01/26	Introduction to python	
3	01/31	Modeling and forecasting trend	
	02/02	Modeling and forecasting trend	
4	02/07	Modeling and forecasting seasonality	
	02/09	Modeling and forecasting seasonality	PS 1 due
5	02/14	Characterizing cycles	
	02/16	Characterizing cycles	
6	02/21	Modeling cycles with ARMA	
	02/23	Modeling cycles with ARMA	PS 2 due
7	02/28	Modeling cycles with ARMA	
	03/02	Forecasting cycles with ARMA	
8	03/07	Forecasting cycles with ARMA	
	03/09	Midterm 1	
9	03/14	Spring break	
	03/16	Spring break	
10	03/21	Putting things together	
	03/23	Putting things together	PS 3 due
11	03/28	Unit roots and stochastic trends	
	03/30	Unit roots and stochastic trends	
12	04/04	Unit roots and stochastic trends	
	04/06	ARCH models: time-varying volatility	PS 4 due
13	04/11	ARCH models: time-varying volatility	
	04/13	Midterm 2	
14	04/18	ARCH models: time-varying volatility	
	04/20	Forecasting with VAR models	Project due
15	04/25	Forecasting with VAR models	
	04/27	Evaluating and combining forecasts	
16	05/02	Review	PS 5 due