

**THE UNIVERSITY OF HONG KONG
FACULTY OF BUSINESS AND ECONOMICS**

ECON 6081: Quantitative Macroeconomics: Data, Model, and Policy

GENERAL INFORMATION
Instructor: Lichen ZHANG Email: lichenz@hku.hk Office: 901 KKL Phone: 64358041 Consultation times: TBA Tutor: Pre-requisite(s): ECON6012 Macroeconomic Theory. This course is aimed for PhD students or advanced master students who are interested in doing research on quantitative macroeconomics. Students who are in other fields (e.g. finance) but are interested in learning methods on computation and calibration are also welcome. Students should know the basics of bellman equation and dynamic programming. Co-requisite(s): Mutually exclusive: Course website: Moodle via HKU Portal e-learning Other important details:
COURSE DESCRIPTION
<p>The primary goal of the course is to equip students with the numerical tools (data skills and computation skills) necessary to tackle interesting questions in quantitative macroeconomics. The course consists of three major parts: data, model, and policy.</p> <p>The first part focuses on showing students how to deal with macro and micro data in economics and more importantly, how to find interesting empirical patterns from the data.</p> <p>The second part is about the study of computational methods and algorithms useful to solving and analyzing macro models. I will teach basic numerical methods. Then We are going to apply them to solve different types of heterogeneous agent models, from the most basic ones (e.g. Huggett (1993), Aiyagari (1994)) to lots of their extensions (e.g. life-cycle model (Huggett (1995)), aggregate uncertainty (Krusell and Smith (1998)), firm dynamics (Khan and Thomas (2014)), occupation choice (Cagetti and De Nardi (2006)) etc.). Moreover, we are going to learn techniques on estimating and calibrating those models.</p> <p>The third part of the course is devoted to ongoing frontier research in macroeconomics based on heterogeneous-agent models. What can we do using the class of heterogeneous-agent models we learn? One of the most important applications is to provide policy guidance. We are going to see a list of such papers at the frontier of quantitative macro, and students should also try to come up with their own ideas that can potentially contribute to their dissertation.</p> <p>This is not a course in computer languages so students are responsible to learn to write their codes. Students can choose their favorite language (Matlab, Fortran, C, Julia, Python etc...).</p>
COURSE OBJECTIVES
<ol style="list-style-type: none">1. To provide a thorough introduction to empirical facts on inequality and growth2. To apply statistic methods to measure inequality and growth using micro and macro data3. To build up theoretical framework that can be used to learn the relationship between inequality and growth4. To use theoretical framework to provide policy guidance on inequality and growth
FACULTY LEARNING GOALS (FLGs)
FLG1: Acquisition and internalization of knowledge of the programme discipline

FLG2: Application and integration of knowledge FLG3: Inculcating professionalism FLG4: Developing global outlook FLG5: Mastering communication skills FLG6: Cultivating leadership			
COURSE LEARNING OUTCOMES (CLOs)			
Course Learning Outcomes		Aligned Faculty Learning Goals (FLGs)	
1. Able to use micro and macro data to construct different types of measures and empirical moments 2. Basic numerical methods 3. Algorithms on computing heterogeneous agent models with extensions as well as stationary distribution and simulations 4. Basic calibration strategies 5. Frontiers of literature on quantitative macro		FLG 1,4 FLG 1,2,3,4 FLG 2, 3, 5 FLG 1,2,3,4 FLG 2,3,4,6 FLG 1, 2,3,4	
COURSE TEACHING AND LEARNING ACTIVITIES			
Course Teaching and Learning Activities		Expected Study Hours	Study Load (% of study)
Lectures		36	30%
Tutorials		12	10%
Self-study		72	60%
Total		120	100%
Assessment Methods			
Assessment Methods	Brief Description (Optional)	Weight	Aligned Course Learning Outcomes
Referee report	3-page double-space referee report	40%	1-5
In-class 5-minute data presentation	5-minute in-class data & figure presentation (students need to collect data and produce figures by themselves)	10%	1-3
In-class 30-minute paper presentation	Choose one paper from the reading list I provide to prepare a 30-minute presentation. Students can do it alone or organize 2-member or 3-member groups	30%	1-5
Projects		20%	1-5
Total		100%	
STANDARDS FOR ASSESSMENT			
Course Grade Descriptors			
A+, A, A-	Strong evidence of superb ability to fulfill the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesis.		
B+, B, B-	Strong evidence of the ability to fulfill the intended learning outcomes of the course at all levels of learning: describe, apply, evaluate, and synthesis.		
C+, C, C-	Evidence of adequate ability to fulfill the intended learning outcomes of the course at low levels of learning such as describe and apply but not at high levels of learning such as evaluate and synthesis.		

D+, D	Evidence of basic familiarity with the subject.
F	Little evidence of basic familiarity with the subject.

Assessment Rubrics for Each Assessment (Please provide us the details in a separate file if the space here is not enough)

COURSE CONTENT AND TENTATIVE TEACHING SCHEDULE

Week 1

Quantitative macro and the choice of calibration v.s. estimation.
An overview of commonly used micro data on households and firms.

Brief introduction to calibration
Starting from a simple representative growth model
Cooley's paper
Gianluca Violante's notes

Week 2

Data: measurement Part I
Macro data (BEA-NIPA) v.s. micro data (CPS, PSID, CEX, Compustat etc.)

Week 3

Data: measurement Part II
Macro data (BEA-NIPA) v.s. micro data (CPS, PSID, CEX, Compustat etc.)
Data Visualization

Week 4

Basic numerical methods

Computation basics, newton, golden search, discretization of productivity process, estimation of income dynamics from panel data

Week 5

Simplest heterogeneous agent model: Huggett (1993), Aiyagari (1994)
Algorithm and extensions

Week 6

A very practical and efficient algorithm on solving heterogeneous agent model: Mongey's method

Week 7

Aiyagari model with aggregate shocks: Krusell-Smith Algorithm
Sobol sequences and their use in multidimensional optimization
How to compute transitional dynamics?

Week 8

Infinite-horizon heterogeneous agent model application: firm dynamics model
Hopenhayn (1992 Econometrica)

Khan and Thomas (2014 JPE)
Zhang (2021 WP)

Week 9

Heterogenous agent over-lapping generations model
Huggett (1995)
The algorithm and extensions

Week 10

More on heterogeneous OLG. What can we do using heterogenous agent OLG?
Application to optimal Ramsey taxation in heterogeneous-agent OLG models.

Conesa, Kitao, Krueger (2009 AER), Karabarbounis (2016 AEJ:Macro)

Week 11

Macro-micro model calibration and identification: Heathcote-Storesletten-Violante framework

Week 12: Further topics

Heterogenous agent OLG with occupational choice

Cagetti and De Nardi (2006 JPE)

Bhandari and McGrattan (2020 QJE)

Gao and Zhang (2021 WP)

Heterogenous agent OLG with human capital accumulation

Huggett et al. (2014 AER)

Seshadri and Lee (2019 JPE)

Week 13

Students' presentations

REQUIRED/RECOMMENDED READINGS & ONLINE MATERIALS (e.g. journals, textbooks, website addresses etc.)

The course will not have a specified textbook and will be based on the lectures notes that I write, together with a list of papers.

MEANS/PROCESSES FOR STUDENT FEEDBACK ON COURSE

- yes conducting mid-term survey in additional to SETL around the end of the semester
 Online response via Moodle site
 Others: _____ (please specify)

COURSE POLICY (e.g. plagiarism, academic honesty, attendance, etc.)

1. Lecture PDF files will be posted on Moodle before each class. Please download and bring them to class.
2. Assignments: **All assignments must be typed.** As a researcher, you should learn how to use Latex/Lyx.
3. Elaboration and some examples/handouts will be done only in class. You will miss a lot of material if you skip classes.

4. STATA: We are going to use STATA to deal with data in this course

5. Do check your email regularly for course announcements from the instructor. But do not abuse the convenience of emails.

a. Do not ask about things you are supposed to know, such as those appear in Moodle or emails from the instructor.

b. **Email is only for very quick questions that instructor can answer within 1-2 sentences.** For long questions, please come to the office hour of the instructor, or talk to instructor after each week's lecture.

6. Academic Conduct

The University Regulations on academic dishonesty will be strictly enforced! Please check the University Statement on plagiarism on the web: <http://www.hku.hk/plagiarism/>

Academic dishonesty is behavior in which a deliberately fraudulent misrepresentation is employed in an attempt to gain undeserved intellectual credit, either for oneself or for another. It includes, but is not necessarily limited to, the following types of cases:

a. Plagiarism - The representation of someone else's ideas as if they are one's own. Where the arguments, data, designs, etc., of someone else are being used in a paper, report, oral presentation, or similar academic project, this fact must be made explicitly clear by citing the appropriate references. The references must fully indicate the extent to which any parts of the project are not one's own work. Paraphrasing of someone else's ideas is still using someone else's ideas, and must be **acknowledged**.

b. Unauthorized Collaboration on Out-of-Class Projects - The representation of work as solely one's own when in fact it is the result of a joint effort. Where a candidate for a degree or other award uses the work of another person or persons without due acknowledgement:

(1) The relevant Board of Examiners may impose a penalty in relation to the seriousness of the offence;

(2) The relevant Board of Examiners may report the candidate to the Senate, where there is *prima facie* evidence of an intention to deceive and where sanctions beyond those in (1) might be invoked.

Plagiarism will automatically result in at least a zero score in the plagiarized assignment or examination. Serious cases will be referred to the University's Disciplinary Committee.

ADDITIONAL COURSE INFORMATION (e.g. e-learning platforms & materials, penalty for late assignments, etc.)