Syllabus for ECON 7800: Macroeconomics

Mario Silva
msilva913@hkbu.edu

Fall 2023

Course Time: Monday, 6:30pm-9:20pm DLB 905 (Section 1)
Wednesday, 2:30-5:20pm, WLB917 (Section 2) Office: WLB 519
Office hours: Monday, 1:30-4:30, and by appointment

1 Summary

This course is an introduction to macroeconomics, the study of economic aggregates. Whereas microeconomics focuses on particular entities–consumers, firms, or industries–taking the rest of the economy as given, macroeconomics focuses on general equilibrium. Of particular interest are fluctuations in consumption, investment, output, unemployment, and inflation. Macroeconomics can also be divided into theory of growth or business cycle fluctuations. We will cover some long-run issues in class, particularly related to money, but will emphasize business cycle fluctuations.

In the first lecture, we provide an introduction to core concepts, a brief history, and standard issues of measurement (GDP, price indices, inflation, etc.) We talk informally about the decomposition of a macro series into cycle and trend and regularities in the comovement of many series with output. In the second lecture, we briefly introduce time series methods (Markov chains and autoregressive moving processes), discuss how to filter time series, and also delve into dynamic systems.

The second block introduces macroeconomics in the simplest setting: a static production model. We set up and solve both the social planning problem and decentralization of a one-shot production economy. Then we examine the effects of imperfect competition, taxation. This lecture serves also serves as an introduction to the Julia language, which we use to compute equilibria. You should try to have Julia installed and running by this lecture, and ask if you have any major questions.

The third block comprises a lecture on overlapping generations (OLG) models, in which individuals have finite lives and each period contains individuals from different generations.

We study a simple OLG model to capture dynamic tradeoffs between consumption and investment, and then use it as a vehicle for introducing fiat money. Young individuals acquire money in order to finance consumption when old. We then examine a more advanced model to study banking issues.

The fourth block, consisting of three lectures, is an introduction to the business cycle theory. We start out with the standard real business cycle model; there are productivity shocks, and individuals respond by changing their choice of consumption, investment, and labor supply. We calibrate and simulate the basic model. We see how the real business cycle model fits some cyclical features of the data reasonably well but misses others. While we solve the full nonlinear version of the model, we also examine its log linearized version.

In simulating business cycle models, we will discuss Euler-equation based methods, which are valid when the first order conditions are sufficient; and perturbation methods, which consider a Taylor approximation around the steady state.

We next consider several extensions to the model which improve performance. These include the role of investment-specific productivity shocks, and endogenous entry of firms selling differentiated goods, which affects households' ability to diversity consumption over the business cycle. These assumptions improves the performance in several dimensions.

In general, these models fit into the class called *dynamic stochastic general equilibrium models* (DSGE). The reason is that there is a focus on general equilibrium in a dynamic context subject to shocks. Agents' expectations of the future–which influence their choice today–is a key endogenous variable of the system. In solving these models, we typically assume that agents form the best forecast given available information. This assumption is called *rational expectations*.

In the fourth block, we incorporate financial frictions. In this setting, firms are restricted in their ability to invest due to collateral (limited enforcement) or there is a moral hazard problem in which firms' investment return is stochastic but unobservable to creditors without costly monitoring. In this case, the optimal contract has creditors requiring a repayment threshold and monitoring if the entrepreneur does not satisfy it. These models capture the fact that movements in asset prices–caused by shocks to productivity or other forces–have an adverse effect on investment and thereby induce a downturn.

Up to this point, there has been no role for monetary policy or a central bank. Indeed, this class of models features the so-called classical dichotomy: real variables can be solved independently of nominal variables. The fifth block rectifies this deficiency using a liquidity-based business cycle model. We study an environment in which households receive preference shocks and, due to anonymity, require money to settle transactions. However, they can also obtain money by selling bonds and capital to households who did not receive such

shocks. Capital plays a dual role as a production input and a partially liquid asset. The central bank implements monetary policy by purchasing bonds using money in a secondary market. In general, inflation has opposing effects: it taxes real balances, which discourages consumption and production, but it also triggers substitution into capital. The right interest-rate policy can offset these two. Provided capital is sufficiently liquid and there are sufficient liquidity shocks, a lower nominal interest rate raises consumption and investment (and hence output) and reduces inflation. Another way to break the classical dichotomy is through price stickiness, a feature of the so-called New Keynesian models. We include by discussing ways in which price stickiness may improve the fit of the model, even though it is not essential.

The sixth block is a treatment of models with heterogeneous agents. For these models, the households cannot be collapsed into a *representative agent*, as is the case for the prior models. The wealth distribution depends on prices and consumption decisions, which in turn depend on the wealth distribution. The first model we examine is Aiyagari(1994). Here, households make a consumption/savings decision with idiosyncratic labor income risk and a borrowing constraint. Due to the precautionary savings motive, steady-state equilibrium features greater capital and lower interest rates than in the absence of labor income risk. This model cannot be solved analytically; we examine it numerically in a Julia program. Next, we study a similar setting by Guerrieri and Lorenzoni (2017), in which households are faced with a credit crunch–a tightening of the borrowing constraint over several periods. The interest rate falls sharply on impact, overshooting the new steady state as households attempt to increase their savings. Poorer households raise labor hours and wealthier households reduce them. Since the latter are more productive on average, output actually falls due to a composition effect.

In the seventh block, we wrap up the course with a search-and-matching approach to unemployment. Unemployment is both a key variable of interest and also important consideration in the assessment of income risk, unemployment benefits, business cycle asymmetries, and unutilized capacity. Finally, it provides an additional propagation mechanism in the economy.

2 History and methodology

Macroeconomics–as separate from microeconomics–was only developed in the 1930's in *The General Theory of Employment, Interest, and Money* by John Maynard Keynes. This work introduced several key ideas, most notably the notion of the possibility of insufficient aggregate demand, the theory of liquidity preference and liquidity premium, and the fiscal multiplier, that is, the effect of government purchases on output. However, the theory was

informal and was used to impose constraints on econometric systems of equations. Lucas (1972) pioneered theoretical dynamic systems featuring intertemporal optimization and rational expectations. Rational expectation means that agents–households and firms–optimally forecast future quantities, which influence current decisions. Kydland and Prescott (1982) developed the first significant business cycle model consisting of optimizing agents, rational expectations, and market clearing. This work initiated a long line of research of so-called dynamic stochastic general equilibrium models. Blanchard and Kiyotaki (1987) considered the role of monetary policy transmission operating through monopolistic competition and nominal rigidities. Mortensen and Pissarides (1994) seveloped a search and matching approach to unemployment. Lively literatures have developed on liquidity (Lagos and Wright 2005), heterogeneous agents (Krusell and Smith 1998, Kaplan and Violante 2010), financial frictions (Kiyotaki and Moore 1997; Bernanke, Gertler and Gilchrist 1999), and unemployment (Mortensen and Pissarides 1994).

3 Textbook

There is no simple textbook–or set–which offers a comprehensive treatment of macroeconomics. Course lectures will draw on a number of different texts, alongside the lecture notes and papers. The aim of the lecture notes is to synthesize the material and thereby learning. The course draws on material from the following books:

Williamson, Stephen D. *Macroeconomics*, 6th edition.

Ljungqvist, Lars and Sargent, Thomas. *Recursive macroeconomic theory.*

Petrosky-Nadeau, Nicolas and Wasmer, Etienne. *Labor, credit, and goods markets: the macroeconomics of search and unemployment*

McCandless, G.T. Jr. & Wallace, N. (1992). *Introduction to Dynamic Macroeconomic Theory: An Overlapping Generations Approach.*

Hamilton, James. *Times series analysis.*

Azariadis, Costas. *Intertemporal Macroeconomics.*

McCandless, George. *The ABCs of RBCS.*

The first text, by Williamson, provides an excellent intuitive verbal and graphical treatment of many of the course topics. I strongly recommend obtaining a copy of the text. The course,

however, is somewhat more technically advanced from the point of view of programming and simulating model.

The second text, often abbreviated LSP, also overlaps with course topics. However, unlike the Williamson text, it is very minimal in empirics and the writing style is not very friendly for students. It is useful as a supplement in some of the more technical aspects of the material.

The text by Hamilton is the standard reference on time series analysis, as is the text by Azariadis for dynamic systems. McCandless' text offers very practical guidelines on solving real business cycle models. The text by McCandless and Wallace is a nice supplement on overlapping generations models. While these textbooks are handy to have on had, owning a copy is not a priority.

The text by Petrosky-Nadeau and Wasmer, abbreviated LCGM, is focused, intuitive, and a great supplement to the material on search frictions and unemployment. I do recommend getting a copy of this one.

4 Grade breakdown

The final grade for the course will be determined as follows:

Problem sets: 35%

Referee report: 15%

Attendance/Participation: 10%

Midterm: 15%

Final Exam: 25%

The grade is comprised of problem sets, midterm, the final exam, a referee report on a paper, and attendance and participation points. Note that a full 60% of the course is not based on exams. This is designed so that you focus more on practicing the material, connecting the theory and the programming, and learning to work with others. It is important to develop skills beyond those which readily lend themselves to testing.

5 Homework assignments

Homework questions involve a mix of analytical/numeric problems to be done by hand and computational problems. The latter may involve replicating results or simulating a model.

Some of these will require a lot of time, so start early and work patiently. You are allowed to work in groups of 2-3 people.

6 Referee reports

Doing a close reading and assessing articles critically is an important skill in economics. Accordingly, you will write a referee report of a paper. I will provide a list of possible papers, but you are welcome to request an article outside the list if it complements the course material well. In general, the structure of the referee report is

- Summary (includes statement of research problem, methodology, and relation to literature)
- Major revisions (what are the major areas in which the paper can be improved?)
- Minor revisions (in what minor ways can the paper be improved? This includes issues of flow, presentation, and auxiliary results).

The referee reports will cover major extensions and work related to the themes of the course that were not feasible due to time constraints. I emphasize that in order to adequately assess the paper in the context of the literature, you will need to reference several background papers and concurrent work in the referee report. You can also submit the referee report in groups of 2-3 people.

6.1 How to study for this course

Lectures are dense, and the course covers an ambitious amount of material. To better digest the material, I suggest the following guidelines.

- You will receive the lecture material several days prior to lecture. Review the lecture as much as possible *before* class. You will be able to follow the lecture more effectively as a result.
- Next, review the lecture a day (or at most two) after class as you work on the homework.
- Discussing and work through problems with classmates. Practice explaining material to the colleagues–this helps cement ideas in your head.
- If confused or need clarification, ask a question on Moodle. That way everyone can benefit.
- Do supplementary reading and use self-testing to solidify understanding.

6.2 Computation and Julia

This course will make heavy use of the open-source programming language Julia. For installation and a set of online lectures, see https://julia.quantecon.org/getting_started.html. You should install the Julia language and an editor. For the latter, I strongly suggest Visual Studio Code. The Quantecon website provides detailed instructions. I will also be available to take questions related to installation and setup during Lecture 2 and in office hours.

7 Typesetting

You are free to either write up homework assignments by hand or type. The referee report, however, should be typed. While you can do this in a regular word processor, it is very convenient and useful to use a markdown editor like Obsidian. This allows one to easily type math, embed images, and many other tasks. However, it is perfectly fine to write up homework by hand and scan, just be sure to ensure legibility.

8 Course outline

Introduction

Week 1: Introduction to course: key concepts, brief history, and measurement.

Week 2: Basic time series methods, business cycle decomposition, and dynamic systems

The static production model

Week 3: Basic static production model. Introduction to Julia for computation of equilibria.

Overlapping generations and long-run trends

Week 4: Overlapping generations model I: growth and liquidity

Business cycle fluctuations

Week 5: Basic real business cycle model. Suggested reading: King and Rebelo (1999), 'Resuscitating Real Business Cycles'

Week 6: Solution of RBC model and extensions

Week 7: Endogenous entry, product variety, and business cycles. Suggested reading: Bilbiie, Ghironi, and Melitz (2012)

Week 8: Midterm covers material around here.

Financial frictions

Week 9: Financial frictions in business cycle models. We focus on the credit cycle model of Kiyotaki and Moore 1997.

Liquidity and monetary policy: short run and long run

Week 10: A liquidity based model of monetary policy.

Wealth heterogeneity and liquidity

Week 11: Introduction to heterogeneous agents: Aiyagari (1994) and Guerrieri and Lorenzoni (2017)

Unemployment

Week 12: Unemployment (Mortensen-Pissarides framework) and business cycle properties