Introduction to Macroeconomic Theory II
Econ 71200

Spring, 2023
The City University of New York
The Graduate Center

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Lectures: Wednesday, 10:00 am – 1:00 pm
Office hours: Wednesday, 1:00 pm – 2:00 pm
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Summary and objectives

This is the second and last GC CUNY core course on macroeconomics. The goal of the course is to provide the students with an overview of the most important and relevant tools of modern macroeconomic theory. The material is selected with the idea to serve as a basis for those students who specialize in macro, and to serve as a sufficiently broad and deep overview for those students who specialize in other areas and who need to use macro tools in their own research.

The course includes the following three parts.

1. In Part I, we describe extensions of the standard neoclassical growth model in discrete time, namely, we augment the benchmark representative-agent version of the model to include heterogeneity, incomplete markets, occasionally binding constraints, and demographics, among others.
2. In Part II, we cover modern monetary theory, namely, we study new Keynesian (NK) models by analyzing both representative-agent and heterogeneous-agent setups.
3. In Part III, it acquaints the students with some models in continuous time. Specifically, we first make a brief overview of topics on dynamic optimization in continuous time, and we then present models like investment models, growth models, search models and discuss their empirical relevance.

Learning goals and outcomes

1) Demonstrate good understanding of macroeconomic theory, including growth theory and monetary theory.
2) Describe the empirical evidence regarding these theories.
3) Develop some programming skills in MATLAB and Dynare.
4) Demonstrate the ability to find new research questions in light of existing theories.
5) Demonstrate the ability to design a theoretical model aimed at answering potentially interesting research questions in the field.
6) Develop writing skills consistent with the requirement of professional publications.

Prerequisites

1st semester of the 1st year Macroeconomics.

Assessment

The course grade will be based on

1. Individual problem sets (25%). These problem sets provide opportunities to bring lecture material into practice. This assignment relates to learning goals 1), 2) and 3).
2. A short research project (15%). In particular, a student will use the studied computational methods to analyze a student-specific macroeconomic model. This assignment is related to learning goals 3)--6).
3. A midterm exam (15%). The exam will cover the first part of the course, and it is related to learning goals 1) and 2).
4. A final exam (40%). The exam will cover the second and third parts of the course – growth theory, and it is related to learning goals 1) and 2).
5. Attendance and class participation (5%).

ACTIVITIES	PERCENTAGES
Problem Sets	25%
Research project	15%
Midterm Exam	15%
Final Exam	40%
Attendance, class participation	5%

Policies

1) There will be no make-up exams and late problem sets receive a grade of zero; no exceptions.
2) The members of the class who follow the course online will be asked to turn on their web cameras during the lectures.
3) All the exams will be in person.

Texts

Lecture notes and slides are the main material for the class. The following textbooks are also helpful (but not required):

- Barro, R. and X. Sala-i-Martin, (2004). Economic Growth. 2d edition. The MIT press.
- Galí, J., (2008). Monetary Policy, Inflation, and the Business Cycle. Princeton University Press: Princeton, New Jersey.
- Ljungqvist, L. and T. J. Sargent, (2012). Recursive Macroeconomic Theory, 3^{d} edition, The MIT press.
- Pissarides, C., (2000). Equilibrium Unemployment Theory. 2nd edition. The MIT Press. Chapters 1-3.
- Walsh, C., (2017). Monetary Theory and Policy. 4th edition. The MIT press.

Topics

Note: The content is subject to changes depending on the student's progress and feedback.

Introduction.

Objectives of the course. Syllabus. Grading system.

Part I. The Neoclassical Growth Model in Discrete Time.

1. A review of notions and concepts of economic dynamics.

Optimal control problems. Equilibrium problems. Markov processes. Pareto optimum. Competitive equilibrium. Two Fundamental Theorems of Welfare Economics. Balanced growth. Recursive competitive equilibrium.

Primary:

- Lecture notes.

Secondary:

- Ljungqvist, L. and T. J. Sargent, (2012). Recursive Macroeconomic Theory, 3^{d} edition, The MIT press, Chapter 3, 7, 8, 12.
- Krueger, D., (2012). Macroeconomic Theory. Manuscript.

2. Background on numerical techniques for solving dynamic economic models.

Parameterized expectations algorithm – an example of global solution method. Perturbation method – a local solution method.

Primary:

- Maliar, L. and S. Maliar, (2005). Parameterized expectations algorithm: how to solve for labor easily. Computational Economics 25, 269-274.
- Marcet, A. and G. Lorenzoni, (1999). The parameterized expectation approach: some practical issues. In: Marimon, R., Scott, A. (Eds.), Computational Methods for Study of Dynamic Economies. Oxford University Press, New York, pp. 143–171.

Secondary:

- Judd, K. and S. Guu, (1993). Perturbation solution methods for economic growth models. In H. Varian, (Eds.), Economic and Financial Modeling with Mathematica, Springer Verlag: New York, USA, pp. 80-103.
- Maliar L. and S. Maliar, (2003). Parameterized expectations algorithm and the moving bounds. Journal of Business and Economic Statistics 21(1), 88-92.
- Schmitt-Grohé, S., and M. Uribe, (2004). Solving dynamic general equilibrium models using a second-order approximation to the policy function. Journal of Economic Dynamics and Control 28 (4), 755-775.

3. Heterogeneous-agent models with complete markets.

Heterogeneous agents (HA) models with complete markets. Aggregation and a representative consumer.

Primary:

- Ljungqvist, L. and T. Sargent, (2012). Recursive Macroeconomic Theory. The MIT Press, Chapter 8.
- Maliar, L. and S. Maliar, (2001). Heterogeneity in capital and skills in a neoclassical stochastic growth model. Journal of Economic Dynamics and Control, 25, 1367-1397.
- Maliar, L. and S. Maliar, (2003). The representative consumer in the neoclassical growth model with idiosyncratic shocks. Review of Economic Dynamics 6, 362-380.

Secondary:

- Chatterjee, S., (1994). Transitional dynamics and the distribution of wealth in a neoclassical growth model, Journal of Public Economics 54, 107-119.
- Constantinides, G. (1982). Intertemporal asset pricing with heterogeneous consumers and without demand aggregation. Journal of Business, 55, 253-267.
- Maliar, L., S. Maliar and J. Mora, (2005). Income and wealth distribution along the business cycle: implications from the neoclassical growth model, BE Journals in Macroeconomics, Topics in Macroeconomics 5(1), Article 15.

4. Heterogeneous-agent models with incomplete markets.

A HA model with incomplete markets – a "Bewley" model. An endowment economy. A production economy. Welfare implications of market incompleteness. Economies with multiple stationary equilibrium. Solving for a stationary equilibrium of the Bewley model.

Primary:

- Aiyagari, S. R. (1994). Uninsured idiosyncratic risk and aggregate saving. Quarterly Journal of Economics 109, 659-689.
- Akira Toda, A., (2017). Huggett economies with multiple stationary equilibria, Journal of Economic Dynamics and Control 84, 77-90.
- Davila, J., J. H. Hong, P. Krusell, and J. V. Rios-Rull. Constrained efficiency in the neoclassical growth model with uninsurable idiosyncratic shocks. Econometrica 80(6), 2431-2467.
- Ljungqvist, L. and T. Sargent, (2012). Recursive Macroeconomic Theory. The MIT Press, Chapter 18.

Secondary:

- Huggett, M. (1993). The risk-free rate in heterogeneous-agent incomplete-insurance economies. Journal of Economic Dynamics and Control 17, 953-969.
- Huggett, M. (1997). The one-sector growth model with idiosyncratic shocks: steady states and dynamics. Journal of Monetary Economics 39, 385-403.
- Judd, K., L. Maliar, S Maliar and I. Tsener, (2017). How to solve dynamic stochastic models computing expectations just once. Quantitative Economics 8 (3), 851-893.

Part II. The New Keynesian (NK) Model in Discrete Time.

1. Motivation: monopolistic competition and sticky prices.

Why a real-business cycle model with money in utility does not explain the regularities in the data. Monopolistic competition under flexible prices. A one-period model with sticky prices.

- Galí, J., (2008). Monetary Policy, Inflation, and the Business Cycle. Princeton University Press: Princeton, New Jersey. Chapter 2, and Appendix to Chapter 3.
- McCallum, B.T., (1989). Monetary Economics: Theory and Policy, New York: MacMillan Publishing Company, Chapter 3.
- Walsh, C., (2017). Monetary Theory and Policy. 4th edition. The MIT press, Chapter 2.

2. The NK model with Calvo pricing.

The log-linearized NK model. Positive analysis. Forward guidance. Critiques and extensions of the basic model. The NK Phillips curve in the data.

Primary:

- Galí, J., (2008). Monetary Policy, Inflation, and the Business Cycle. Princeton University Press: Princeton, New Jersey. Chapter 3.
- Maliar, L. and J. Taylor, (2018). Forward guidance: Is it useful after the crisis? CEPR working paper DP 13383.
- Walsh, C., (2017). Monetary Theory and Policy. 4th edition. The MIT press, Chapter 8.

Secondary:

- Christiano, L., M. Eichenbaum and C. Evans, (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. Journal of Political Economy 113/1, 1-45.
- Smets, F. and R. Wouters, 2003. An estimated dynamic stochastic general equilibrium model of the Euro area. Journal of the European Economic Association 1(5), 1123- 1175.
- Smets, F. and R. Wouters, 2007. Shocks and frictions in US business cycles: a Bayesian DSGE approach. American Economic Review 97 (3), 586-606.

3. A zero lower bound on nominal interest rates.

The NK model with a zero lower bound (ZLB) on nominal interest rates. Liquidity trap. Closed-form solutions.

Primary:

- Benhabib, J., S. Schmitt-Grohé and M. Uribe (2001). The perils of Taylor rules, Journal of Economic Theory 96, 40-69.
- Cochrane, J. (2017). The new-Keynesian liquidity trap. Journal of Monetary Economics 92, 47-63.
- Maliar, L. and S. Maliar, (2015). Merging simulation and projection approaches to solve high-dimensional problems with an application to a new Keynesian model. Quantitative Economics 6 (1), 1-47.

Secondary:

- Guerrieri, L. and M. Iacoviello, (2015). OccBin: a toolkit for solving dynamic models with occasionally binding constraints easily. Journal of Monetary Economics 70, 22-38.

- Maliar, L. (2018). Continuous time versus discrete time in the new Keynesian model: closed-form solutions and implications for liquidity trap. CEPR working paper DP 13384.

4. The NK model: optimal monetary policy.

Time inconsistency: a toy example. Ramsey problem: the optimal policy problem. Commitment versus discretion. A ZLB on nominal interest rates.

Primary:

- Galí, J., (2008). Monetary Policy, Inflation, and the Business Cycle. Princeton University Press: Princeton, New Jersey. Chapters 4, 5.
- Woodford, M., (2010). Optimal monetary stabilization policy. Manuscript.

Secondary:

- Clarida, R., Galí, J. and Gertler, M., (1999). The science of monetary policy: a new Keynesian perspective. Journal of Economic Literature 37(4), 1661-1707.
- Werning, I., (2012). Managing a liquidity trap: monetary and fiscal policy. Manuscript.

5. The two-agent heterogeneous NK models.

Monetary policy with HA.

Primary:

- Debortoli, D. and J. Galí, (2017). Monetary models with heterogeneous agents: insights from TANK models. Manuscript.
- Bilbiie, F., (2019a). The new Keynesian cross. Journal of Monetary Economics, forthcoming.

Secondary:

- Auclert, A., M. Rognlie, and L. Straub, (2018). The intertemporal Keynesian cross. Manuscript.
- Kaplan, G., B. Moll, and G. Violante, (2018). Monetary policy according to HANK. American Economic Review 108(3), 697-743.

Part III. Continuous-Time Macroeconomic Models

1. Dynamic mathematical tools in continuous time.

Differential equations. Dynamic optimization in continuous time.

Primary:

- Barro, R. and X. Sala-i-Martin, (2004). Economic Growth. McGraw Hill. Appendix.
- Acemoglu, D., (2009). Introduction to Modern Economic Growth, Princeton University Press, Chapter 7.

Secondary:

- de la Fuente, A., (2008). Mathematical methods and models for economists. Cambridge University Press.

- Sydsæter, K., P. Hammond, A. Sierstad and A. Strøm, (2008). Further Mathematics for Economic Analysis. Prentice Hall.

2. Dynamic models of investment.

The q theory of investment. Internal adjustment costs. External adjustment costs.

Primary:

- Barro, R. and X. Sala-i-Martin, (2004). Economic Growth. McGraw Hill. Chapter 3.2.

Secondary:

- Bagliano, F. C. and G. Bertola, (2004). Models for Dynamic Macroeconomics. Oxford University Press. Chapter 2.
- Romer, D., (2006). Advanced Macroeconomics. McGraw Hill. Chapter 8.

3. The Solow-Swan (1956) growth model.

Introduction to growth: empirical evidence on cross-country disparity. The Solow-Swan model: the steady-state analysis; golden rule; transition; empirical testing; other production functions.

Primary:

- Barro, R. and X. Sala-i-Martin, (2004). Economic Growth. McGraw Hill. Introduction, Chapters 1, 10-12.
- Weil, D., (2012). Economic Growth. Pearson. Eddison Wisley. Chapter 1.

Secondary:

- Barro R., N. Mankiw, and X. Sala-i-Martin, (1995). Capital mobility in neoclassical models of economic growth. American Economic Review 85 (1), 103-115.
- Sala-i-Martin, X., (1997). I just ran two million regressions. American Economic Review 87 (2), 178-183.
- Mankiw, N., D. Romer and D. Weil, (1992). A contribution to the empirics of economic growth, Quarterly Journal of Economics 107, 1072-1085.
- Romer, D., (2006). Advanced Macroeconomics. McGraw Hill. Chapter 1.

4. The Ramsey (1928) growth model.

Fundamental equations. Phase diagrams. Savings rate. Long-run growth.

Primary:

- Barro, R. and X. Sala-i-Martin, (2004). Economic Growth. McGraw Hill. Chapter 2.

Secondary:

- Romer, D., (2006). Advanced Macroeconomics. McGraw Hill. Chapter 2.

5. Continuous-time stochastic optimization.

Stochastic dynamic programming in continuous time. Brownian motion. Ito process. Ito's lemma.

- Turnovsky, S., (2000). Methods of Macroeconomic Dynamics. MIT Press. Chapter 15.

6. Random matching models. Growth in random matching models.

The labor market. Endogenous job destruction. Long-run equilibrium and balanced growth.

Primary:

- Pissarides, C., (2000). Equilibrium Unemployment Theory. 2nd edition. The MIT Press. Chapters 1-3.

Concluding comments.

A brief overview of other potentially interesting topics not covered in class. Future of macroeconomics (large-scale central banking monetary models, large-scale fiscal policy models, machine learning, deep learning, supercomputers, among others).