# Advanced Macroeconomics I: Methods and Models

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## Overview

This twelve-lecture course is an introduction to modern macroeconomis. The goal is twofold. First, we will discuss mathematical tools that are required to solve dynamic stochastic general equilibrium (DSGE) models. This includes both analytical and numerical methods. Second, we are going to discuss a few fundamental microfounded models of modern macroeconomics: neoclassical growth model, real business cycle model (RBC), models with incomplete markets, new-keynesian sticky-price model (NK), and the Kiyotaki-Moore model of financial cycles. Unfortunately, we have no time for other basic macro models: OLG, search models, models of endogenous growth, and open economy models.

## Requirements

- Problem sets - 50%
- Exam - 20%
- Project - 30%

In addition to solving problem sets, students are asked to replicate one of the papers from the list.

## Outline

One precept to be held before the course starts to introduce students to Matlab.

1. Neoclassical growth model: intertemporal preferences, primitives, social planner's problem, Euler equation and transversality condition, steady state, golden rule and dynamic efficiency, continuous-time limit, Pontryagin principle, phase diagrams, state and control variables, anticipated vs. MIT shocks, temporary vs. permanent shocks, continuity of trajectories.

2. Solution methods: shooting algorithm, dynamic programming and Bellman equation, log linearization, Blanchard-Kahn method, calibration and Kaldor's facts.

    - *Precept 1: shooting algorithm and Blanchard-Kahn method in Matlab*

3. Competitative equilibrium: Arrow-Debreu equilibrium, numeraire, no-bubble condition, Walras law, welfare theorems, Radner equilibrium, recursive equilibrium and k-K principle.

4. Fiscal policy: Ricardian equivalence, Ramsey problem, Chamley-Judd result, time consistency and Markov equilibrium.

    - *Precept 2: dynamic programming and endogenous grid point method in Matlab*

5. Adding stochastic shocks: household problem, precautionary motive, completeness of asset markets, idiosyncratic shocks and aggregation theorem, equilibrium concepts, asset pricing and equity premium puzzle.

6. Real business cycle model: Blanchard-Kahn method, impulse response functions, calibration, Solow residual, welfare costs of business cycles, limitations and extensions.

7. Bewley-Huggett-Aiyagari model, Krusell-Smith model and endogenously incomplete markets.

    - *Precept 3: stochastic dynamic programming in Matlab*

8. New-keynesian model: Dixit-Stiglitz model of monopolistic competition, money-in-the-utility and cashless limit, Calvo and Rotemberg pricing, NK Phillips curve and IS curves, costs of inflation, money vs. interest rate rules, Taylor principle.

9. Optimal policy: inflationary bias, divine coincidence, zero lower bound (ZLB), forward guidance, TANK/HANK model, Werning "as if" result.

10. Microfoundations of sticky prices: time- vs. state-dependent price setting, menu costs and (s,S)-policies, Sheshinski-Weiss result, real rigidities and welfare effects.

    - *Precept 4: stochastic Blanchard-Kahn method and impulse responses in Matlab*

11. Firm's problem: q-theory, balance sheet and Modigliani-Miller theorem.

12. Kiyotaki-Moore model: financial frictions, fire sales, pecuniary externalities. Diamond-Dybvig model of bank runs.

## Textbooks

- Acemoglu (2009): "Introduction to Modern Economic Growth"
- Blanchard and Fisher (1993): "Lectures on macroeconomics"
- Gali (2015): "Monetary Policy, Inflation, and the Business Cycle: An Introduction to the New Keynesian Framework and Its Applications"
- Ljungqvist and Sargent (2012): "Recursive macroeconomic theory"
- Romer (2019): "Advanced Macroeconomics"
- Stokey and Lucas with Prescott (1989): "Recursive Methods and Economic Dynamics"
- Walsh (2003): "Monetary Theory and Policy"
- Woodford (2003): "Interest and Prices: Foundations of a Theory of Monetary Policy"