Computational Macroeconomics

Lecture 1: Introduction

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Today's class
Outline

- Course information (aim, schedule, grading, etc.)
- Programming primer in Julia

Background

- Macroeconomics studies aggregate economic phenomena
  – e.g., Economic growth, business cycle, income distribution
- Computational approaches have become the mainstream in macroeconomics
  - Advances in computer performance and growing accessibility of micro data
- Computational and numerical approaches come in handy because they allow us to:
  - Solve complicated models (e.g., those with risk or rich heterogeneity, transition)
  - Answer quantitative questions (e.g., policy x increases GDP by y%)

Course objectives

- Introduce computational methods, techniques, and procedures for solving and analyzing macroeconomic models

- Develop practical skills in computationally solving macroeconomic models through hands-on exercises

  –We will achieve these goals by working mainly on the **overlapping generations (OLG) model**–one of the core frameworks in macroeconomics–and its extension that incorporates household **heterogeneity**

Course structure

- Part 1: Solving household dynamic optimization problems (Lectures 2 and 3)
  - Keyword: discretization, grid search, endogenous grid methods, backward induction
- Part 2: Solving for equilibrium (Lectures 4–7)
  - Keyword: stationary equilibrium, transitional dynamics, calibration, counterfactual analysis
  - Application to macro implications of social security reforms
- Part 3: Notes on other important methods (Lectures 8–10)
  - Keyword: value (policy) function iteration, root finding, optimization, interpolation
- Part 4: Advanced topics and application (Lectures 11–14)
  - Keyword: Aiyagari model, discretizing stochastic income process, heterogeneity
  - Application to macro effects of family policy

Basic information

- **Period**: October 20, 2025 – December 5, 2025 (+ final exam)
- **Time**: Monday 13:45–15:15 and Friday 8:30–10:00
- **Place**: 158 PC pool (L7, 3-5)
- **Prerequisite**: Intermediate-level courses in micro and macro
- **Grading**: Assignments (50%) + Final exam (50%, 90 min)
  - Tentative plan: A coding assignment will be posted in the first week of November, with a deadline of December 5, 2025.

Basic information (cont'd)

- **Instructor**: Kanato Nakakuni (kanato.nakakuni@uni-mannheim.de)
- **Teaching assistant**: Mingjie Xu (mixu@mail.uni-mannheim.de) will lead couple of coding sessions during regular class time (no separate TA sessions)
- **Course materials**: Provided on my GitHub repository, *ComputationalMacro*
  - Please send me an email today with your name and email address. In reply, I will send access invitation to the GitHub repository

Programing language

- In explaining sample code, I will use Julia
- You may use other programming language (e.g., MATLAB, Fortran, Python) for in-class exercises and to submit your coding assignments if that is more comfortable
- Otherwise, please install Julia and a suitable code editor (e.g., Visual Studio Code) on your own laptop
- Please install them before the next class. Links for installation:
  - Julia: https://julialang.org/install/
  - VS code: https://code.visualstudio.com/