Allievi Program, Master in Economics and Ph.D. in Economics

QUANTITATIVE METHODS IN MACROECONOMICS

Spring 2024

Instructor: Professor Claudio Campanale

The purpose of this class is to familiarize the student with some basic techniques that are used in quantitative macroeconomics. The emphasis is not on theory (neither macroeconomic nor mathematical) but on the practical methods to apply on the computer that are useful in macroeconomic research.

The pre-requisites for the course are a basic knowledge of calculus, static optimization, linear algebra and probability. We will us the Python programming language.

1. Why quantitative macroeconomics?

2. Markov chains and applications
   a) Basic theory and simulation
   b) Conversion of an AR(1) process into a Markov chain
   c) Applications: The labour income process and technology shock process

3. Finite horizon dynamic programming
   a) Presentation of the problem for the deterministic case
   b) Solution by numerical discrete dynamic programming
   c) Economic examples: the cake eating problem, the life-cycle consumption saving problem under certainty

4. Some basic numerical procedures:
   a) Root finding
   b) Optimization
   c) Approximation
   d) Application to dynamic programming

5. Introduction to linear difference equations

6. The deterministic neoclassical growth model in discrete time
   a) Basic theory and qualitative solution
   b) Solution by linearization

If time allows we may cover one or more among the following topics

A. Dynamic programming under uncertainty in the discrete case

B. The stochastic neoclassical growth model
   i) Basic theory
   ii) Linearization, impulse response functions
   iii) The prototype Real Business Cycle model

Course material

- A general good reference for the course is: "Lectures in Quantitative Economics" by T.Sargent and J. Stachurski (Available at the website: https://lectures.quantecon.org/)

- A general reference for Numerical Methods in Economics is: "Numerical Methods in Economics" by K. Judd, MIT press.

- For the material on difference equations you may use Chiang, "Fundamentals methods of mathematical economics"

- Handouts based on material available on the web or written by myself, research papers and single chapters form other books will be used as well and suggested during the class based on needs.

Grading

Grading will be based on a set of homeworks (35%) and a final exam (65%)