Research Institute in Economics and Finance
Summer School in Economics and Finance 2023
Computational Economics
Instructor: César Salinas

Lectures:	4 lectures - January 2023
Class hours:	Tuesday-Friday 7pm-10pm
Instructor:	César Salinas
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Prerequisites:

Dynamic Programming and Python.

Course Description: The objective of this course is to provide and equip students with the computational tools necessary to solve dynamic and stochastic models. We will pay particular attention to classic macroeconomic problems, although the tools presented in this course can be used in similar problems studied in various fields of economics.

We will start by introducing the neoclassical growth model and discuss how we can represent this model on the computer. Then, we will exploit the properties of the value function to solve this problem using the full discretization method. We will discuss the advantages and disadvantages of this solution to start discussing other numerical methods that will allow us to solve similar problems such as approximation functions, root finding, and optimization methods. We will discuss the advantages and disadvantages of each of these methods.

Required textbook and resources:

- Judd, Kenneth (1988). Numerical Methods for Economists, Cambridge, MA. MIT Press.
- Ada, Jerome and Cooper, Russell W. (2003). Dynamic Economics, Cambridge, MA. MIT Press.
- Fernández-Villaverde, J., Rubio-Ramírez, J. F., and Schorfheide, F. (2016). Solution and estimation methods for DSGE models. In Handbook of macroeconomics (Vol. 2, pp. 527-724). Elsevier.

Course Organization: This class meets online. You will need the following in order to participate in this course: computer or laptop, reliable internet connection, microphone, access to Zoom and Canvas. A student is responsible for attending the online classes and submit the assignments posted on Canvas.

Assignments: The course will consist of a Problem Set (PS), which must be solved in groups of 4 people, and a final exam (EF) that will be solved individually. The final grade is calculated as follows:

$$\textbf{Final Grade} = 0.4 * (PS) + 0.6 * (EF)$$

TENTATIVE SCHEDULE

Lecture	Date	Topics
1	3-Jan	**Discretization.** Neoclassical growth model, Tauchen and Rouwenhorst methods, Value Function Iteration and Brute Force Grid Search.
2	4-Jan	**Function Approximation.** Collocation and regression approach. Nearest-neighbor interpolation, linear interpolation, polynomial interpolation, spline interpolation. Endogenous Grid Method (Carroll 2006)
3	5-Jan	**Root-finding.** Bisection method, Newton's method, Secant method, Brent's method. First Order Condition and Envelope Condition to solve VFI.
4	6-Jan	**Optimization methods.** Golden Section method, Brent's method. Solve VFI with optimization.