Computational Economics 2020

Assignment 2

(due: Wednesday, May 20, 2020, 11:59 PM (GMT + 1))

The assignment is split into part A and part B which are weighted equally with 15% each. You are allowed to form groups of 2 (if there is a odd number of people, groups of 3 are allowed too). Each group has to present at least one of their solutions.

Please follow these instructions for handing in your assignment:

1. Submit the assignment via Email to Philipp (philipp.mueller@business.uzh.ch). The Email should contain:
    - A single PDF-file with the names of all group members, and assignment number on page 1. The file should contain all your answers and results.
    - The source code in a separate zip archive. The code should be well documented and readable.
2. Only the students taking the course for credits are getting feedback to their solution; feel free to send your solution anyway. A sample solution will be published after the deadline. If you have any specific question, reach out on GitHub `https://github.com/KennethJudd/CompEcon2020/issues`.

Refrain from sharing complete solutions.
For the content of the PDF we expect the following:

1. Provide a brief introduction/ motivation for the problem.
2. Explain how you solved the exercise and show the most relevant calculations (formulas and essential parts of the code) with brief comments.
3. Concisely interpret the results of the exercise.
4. For each exercise the floating text should not exceed 2 pages (this does not include formulas, codes, graphs, and tables).

Exercise B-1

Consider the numerical example in Section 2.3 of Judd et al. (2011).

(A) Replicate the results for the allocations and prices in Appendix A.3.

(B) Replicate the results for the portfolios in Tables 1.

(C) Either use an automatic differentiation (AD) tool of your choice to solve the system of non-linear equations by constrained optimization, or use the AD tool to provide the nonlinear equation solver with accurate derivatives.

Hint: Follow the three steps in Appendix A.1. So, first solve a nonlinear system of equations for the consumption allocations, then determine the asset prices, and finally solve the linear budget equations for the portfolios.

References

[1] Judd, Kenneth L., Felix Kubler, and Karl Schmedders, "Bond Ladders and Optimal Portfolios," *Review of Financial Studies* (2011) 24, 4123–4166.

Exercise B2: Dynamic Programming

Solve the infinite-horizon deterministic optimal growth problem with

$\beta = 0.95$,

$u(c) = \log c$,

$k_{t+1} = F[k_t] - c_t$, and

$F(k) = k + 0.5\,(2 + \sin 2\,\pi\,k)\,k^{.25}$

Solve for $V(k)$ for $k \in [0.1, 2]$. We impose the constraint $0.1 \leq k \leq 2$.

Discretize k into 10^2, 10^3, and 10^4 different capital stokcs.

Use value function iteration and policy function iteration to solve the problem.

Plot the optimal value function and policy function for each choice of discretization.

Exercise B3: Taylor series problem

Let $f(k, \ell) = (k^2 + 3\ell^2)^{1/2}$.

Compute the degree two, three, and five Taylor expansion around (1,1).

Plot the error over [0,2.5]×[0,2.5].

By “plot” I mean give me a contour plot of the error, where different colors represent different error levels.