[Homework] Discrete-Time Dynamic Programming

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Due: Before Friday October 8 2021 14h
Evaluation: Submit your code, the comments of your code, and the answers to the questions through campus.ece.fr:

- code in Python and comments of your code (**no image capture but the actual code!**),
- a short report for the answers to the questions.

Remark:

- Only groups of two or three people accepted. Forbidden groups of one or larger than three people.
- Submit your homework before the deadline. Otherwise, the penalty system explained in the Syllabus file will be applied.
- No plagiarism. If plagiarism happens, both the "lender" and the "borrower" will have a zero.
- Code yourself from scratch. No homework will be considered if you use someone else's code.
- Do thoroughly all the demanded tasks.
- Study the theory.

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1 Problem

An investor has a fund. It has 1 million euros at time zero. It pays 5% interest per year for T=50 years. The investor cannot withdraw the invested money. But, (s)he consumes a proportion (a_t) of the interest at time t and reinvests the rest. What should the investor do to maximize the consumption before T?

2 Tasks

1. Implement the bang-bang controller described in class using the programming language Python.
2. Compute the corresponding total consumption and find the sequence of optimal actions.
3. Plot the consumption as a function of time
4. Plot the action sequence as a function of time.
5. Choose a couple of other strategies (controllers) to compare their respective total consumption to that obtained using the bang-bang approach.
6. Discuss your results.

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