Dynamic Programming Exercise Class 1

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About me

- 2nd year PhD-student
- Third time teaching this course

Structure of exercise classes

- Exercise plan is on the github
- Exercises in jupyter notebooks
- The solutions are available.
- Exercises are mostly about you guys working on exercises and asking me questions
    - I won't talk much at the beginning of the exercise class

Cake-eating problem

$$V_t(W_t) = \max_{c_t} \sqrt{c_t} + \beta V_{t+1}(W_t + 1)$$

$$\text{s.t}$$

$$W_{t+1} = W_t - c_t$$

$$c_t \in \mathbb{R}_+ \tag{1}$$

To solve this problem we must find the policy function $c_t^*(W_t)$ which yields optimal cake-eating behavior.

- To find $c_t^*(W_t)$, we will also need to find $V_t(W_t)$.
- With $W_0 = 5$(5 slices of cake do we begin with) and T=3 (3 days to eat those slices): We are trying to find out how to optimally eat 5 slices of cake over 3 days.

Terminology

- Policy function $c_t^*(W_t)$: yields behavior in every possible state (for all time periods (3,2,1) and for all feasible sets of slices of cake (5,4,3,2,1,0)
- Value function $V_t(W_t)$: How much utility do I get if I have W_t slices of cake on day t.

Once we have solved the model (found policy and value function) we can simulate:

- Give an agent 5 slices of cake and simulate behavior with policy to get how the agent actually end up distributing those 5 slices over the 3 days.

Using Generative AI

- You are allowed to use generative AI during exercises.
- Copilot can see the solutions when working with exercises!
- I suggest disabling co-pilot when doing exercises.