

ECON 210: Section 1

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Welcome!

Logistics

- ▶ Section times: Fridays, 3:00pm-4:50pm, Lathrop 014
- ▶ Office hours: Mondays 5:30pm-7:30pm
 - ▶ <https://stanford.zoom.us/my/marcelosena>
 - ▶ Passcode: 307321
- ▶ E-Mail: `msena@stanford.edu`
- ▶ Grading:
 - ▶ 25% Psets: problem sets due by TA section time.
 - ▶ 75% Take-home exam
- ▶ Highly recommended to work in groups for Psets (up to 5 in a group)
- ▶ All material will be posted on Canvas.

About the sections

- ▶ TA sections are meant to review material and develop dynamic programming skills (widely applicable!)
- ▶ Typically we go over conceptual material + solve problems (with coding)
- ▶ Bring computers if possible!
- ▶ Ask questions!
- ▶ Feedback is always welcome

Questions?

Ready to start some dynamic programming!

Plan for Today

- ▶ A bit on coding
- ▶ Finite-horizon deterministic dynamic programming problem
- ▶ Break
- ▶ Code the solution

A bit on coding

- ▶ Programming camp material uploaded on Canvas
- ▶ For Python and Julia, QuantEcon is a nice reference for Economists. <https://quantecon.org>

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- ▶ Suppose coins available have face value $d = \{1, 5, 10, 25\}$.
- ▶ Think about an algorithm that solves this problem.
- ▶ Does your algorithm change if we add a coin with face value 9?
- ▶ Does your algorithm work to change 387498327489?

Change Problem

We want to find a general solution.

We will formalize the problem and apply dynamic programming principles.

- ▶ Break down the problem into easier sub-problems.
- ▶ Solve the easier sub-problems.

How can we write the problem recursively?

Change Problem

Let

- ▶ $C(p)$ be the minimum number of coins to change a face value of p .
- ▶ Let $x \in d$ be used in the optimal solution.

What is the relationship between $C(p)$ and $C(p - x)$?

Change Problem

What is the relationship between $C(p)$ and $C(p - x)$?

$$C(p) = 1 + \min_{d_i \in d} C(p - d_i) \quad (1)$$

$$\implies C(p) = 1 + C(p - x) \quad (2)$$