Econ 200 AE Spring '25 Week 4

Anirudh Ravishankar, onirudh3@uw.edu

April 25, 2025

Section Information / Reminders

Friday 11:30am, MOR 221.

Office Hours: Tue Thur 11am-12pm, SAV 403.

Weekly material posted on https://onirudh3.github.io/teaching.

Grading:

- Homework: 20% (lowest grade dropped), due every Thursday 11:59pm.
- Writing assignments: 20% (due May 1 and June 5).
- Midterm: 30% **Tuesday, April 29. 8:30am in Kane 130. Bring a calculator and a pen or pencil. Any calculator that doesn't connect to the internet is allowed. The exam is closed book and formula sheets are not permitted.**
- Final: 30% (non-cumulative) June 5.

Tips for the exam

Basically, practice by solving all the problems.

- Tons of past midterms on Canvas, solve them all!
- Solve all the section problems.

Unit 4 Review

Some important things to recall (not exhaustive):

- Game theory terms – simultaneous, one shot, sequential, etc. Please read up on them.
- Best response: The strategy that will lead to a player's most preferred outcome, given the strategies that the other players select.
- Nash equilibrium: The set of strategies in which each player plays a best response to the strategies of the other players.
- Pareto optimal allocation: where no other allocation can make someone better off without making someone else worse off.
- Public good game: a game in which individual players can take an action that would be costly to themselves, but would produce benefits for all players (including themselves).

Problems

1. Amir and Bala play a simultaneous game in which each chooses to either plant Cassava or Rice. Their payoffs are shown the table below as (Amir, Bala):

payoffs: (player1, player2)

		Bala	
		Rice	Cassava
Amir	Rice	3,5	1,1
	Cassava	4,3	6,2

   i. What is a strategy? What strategies are available to Amir and Bala?

Amir's strategies: Rice, Cassava (⟺ Bala's strategies)

   ii. What is a payoff? Which strategy should Bala choose to maximize his payoff if Amir chooses Grow Rice? What if Amir chooses Grow Cassava?

If Amir chooses Rice, Bala will also choose Rice.

If Amir chooses Cassava, Bala will choose Rice again.

Bala has a dominant strategy to play Rice.

iii. Solve the same problem but for Amir.

Bola choose Rice → Amir choose Cossera.

Bola choose Cossera → Amir choose Cossera.

iv. What is the Nash Equilibrium?

(Cossera, Rice)

2. Anna and Brian are discussing what to watch on the TV tonight. There are two choices: a film or the snooker world championships. They can either watch one of the two programs together, or watch different programs in separate rooms. The following table represents the payoffs of Anna and Brian, depending on their choice of program (the first number is Anna's payoff while the second number is Brian's). Based on this information, answer the following.

		Brian	
		Snooker	Film
Anna	Snooker	5,8	1,2
	Film	2,6	4,4

i. What is Brian's best response to Anna choosing snooker? What about if she chooses film?

Best response = BR

BR_{Brian} (Anna chooses snooker) = Snooker

BR_{Brian} (Anna chooses film) = Snooker

ii. Does Brian have a dominant strategy?

Yes, it is playing snooker regardless of what Anna chooses.

iii. Answer the corresponding questions about Anna's choices.

BR_{Anna} (Brian chooses snooker) = Snooker

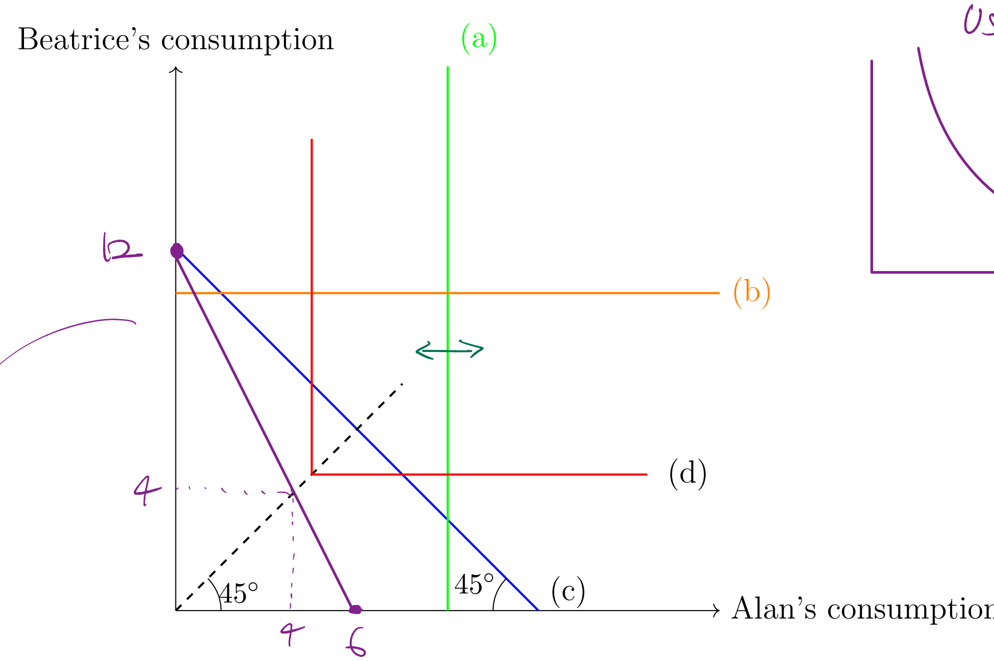
BR_{Anna} (Brian chooses film) = Film

iv. What is the Nash equilibrium here?

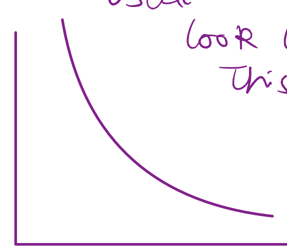
(Snooker, Snooker)

3. The figure below depicts possible indifference curves for Alan, whose utility depends on his and/or his friend Beatrice's level of consumption.

feasible frontier



Usual IC's look like this



i. Which indifference curve shows that Alan is purely self-interested?

(a)

ii. Which indifference curve shows that Alan only cares about Beatrice's consumption?

(b)

iii. Which indifference curve shows that Alan cares about the sum of his and Beatrice's consumption? Analogous to Fixed cost = sum of consumption of both.

(c)

iv. Which indifference curve shows that Alan only cares about the minimum of his and Beatrice's consumption? [Purely optional video on how to draw indifference curves of min function: https://www.youtube.com/watch?v=EEF7QKIp9nI]. min{3,5} = 3

(d) U = min{Alan's consumption, Beatrice's consumption}

Alan: 2 cubes = 1 cup

Beatrice 1 cube = 1 cup

v. Now, assume that the good represented here is cups of tea with sugar. Alan has 12 sugar cubes. He takes two cubes per cup, while Beatrice takes one cube per cup. Then for example, if Alan gives 2 sugar cubes to Beatrice, then she could have 2 cups of tea while Alan can have 5 cups.

* Draw the feasible frontier on the graph above. Purple line

* How many cups of tea would Alan have if he has indifference curve b? What about d? And a?

If b: consumes 0.

d: consumes 4.

a: consume 6.

4. Consider the strategic interaction described by the table below. Note that Row receives the payoff on the left of the comma, and Column receives the payoff to the right.

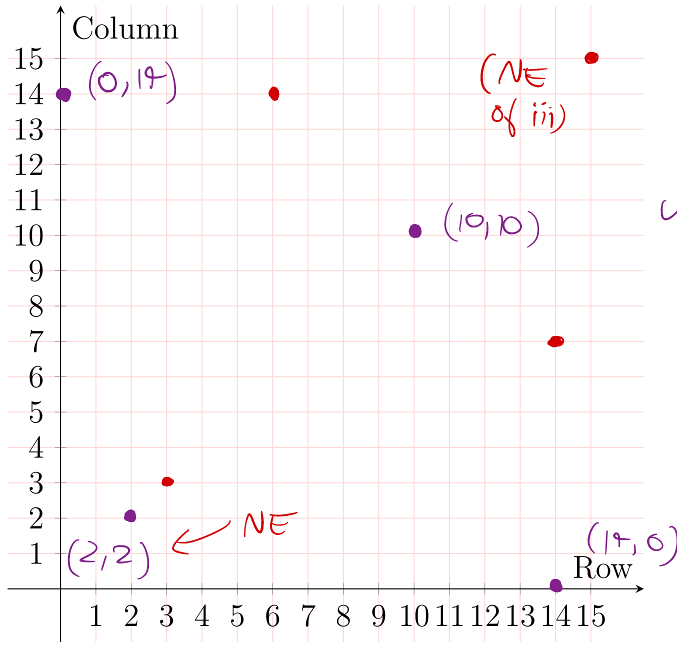
		Column	
		Cooperate	Defect
Row	Cooperate	10,10	0,14
	Defect	14,0	2,2

Suppose that Row and Column are completely self-interested and interact in a one-shot game.

i. What strategy would you expect each player to play in a one-shot game? Why?

Defect, Defect. Mutual best responses.

ii. Is the outcome Pareto efficient? Why or why not. No because we have another outcome (cooperate, cooperate) which makes both better off.



5. Suppose that both Row and Column are somewhat altruistic, so each \$1 received by the other player is worth \$0.50 to them.

i. Rewrite the payoffs in the table to account for the players' social preferences.

		Column	
		Cooperate	Defect
Row	Cooperate	$\boxed{15, 15}$	7, 14
	Defect	14, 7	3, 3

ii. What strategy would you expect each player to play in a one-shot game? Why?

(Cooperate, cooperate)

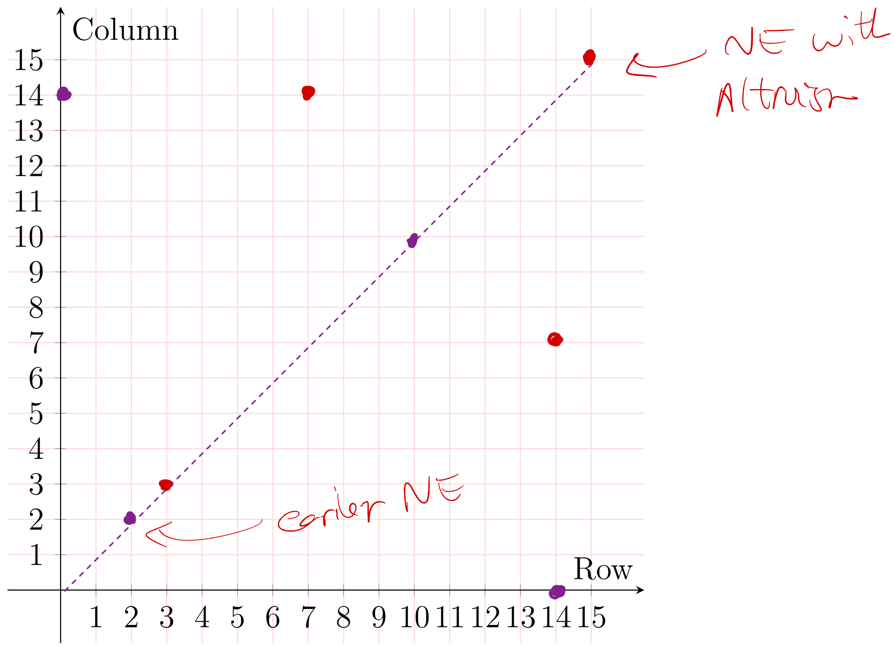
iii. Is the outcome efficient? Why or why not?

Yes.

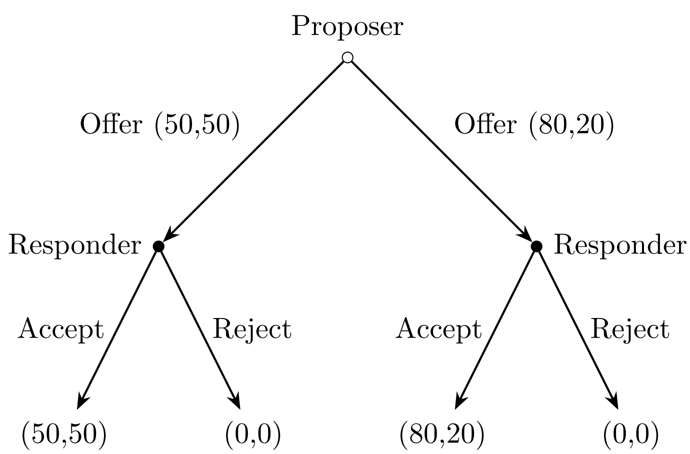
iv. How can social preferences help individuals solve the Prisoner's Dilemma?

Altruism incentivizes players to cooperate.

v. The more standard way to solve this problem would be to take the graph above with the allocations and add altruistic preferences to that. Can you do that for Row to demonstrate that Cooperate would be their dominant strategy if they were slightly altruistic?



6. The figure shows a game tree for an ultimatum game, where the Proposer has \$100 and offers a proportion of it to the Responder, who can either accept or reject the offer. If the Responder accepts, both the Proposer and the Responder keep the agreed share, while if the Responder rejects, then both receive nothing.



becomes (0,25)

i. What should the responder do if the proposer offers (50,50)?

$50 > 0 \therefore$ Accepts.

ii. What should the responder do if the proposer offers (80, 20)?

20 > 0 ∴ Accepts.

iii. What should the proposer do if he knows this?

If proposer know responder always accepts, he offers (80, 20).

iv. How would the outcome of this game change if there was a strong social norm that gave the responder \$25 of satisfaction from rejecting any offer below \$40?

25 > 20 ∴ Rejects if proposer offers (80, 20).

7. There are two apples and two oranges (total) to share between Peter and John. The value (utility) of consuming a fruit depends on whether they already have a fruit of the same kind or not, but is independent of the consumption of the other kind of fruit. Their marginal utilities for each fruit are given in the table below. Based on this information, select the following allocation(s) that are Pareto efficient and explain why.

	Apples		Oranges	
	First	Second	First	Second
Peter	10	6	7	4
John	6	1	4	3

Tip to solve: Consider all combinations:

{(0,0), (2,2)}

{(0,1), (1,2)}

⋮

A: Peter has two apples and John has two oranges.

B: Peter has two oranges and John has two apples.

C: Peter has one orange and John has one orange and two apples.

D: Peter has one apple and two oranges and John has one apple.

A: Utility of Peter = P

Utility of John = J

$P = 16 \qquad J = 7$

Consider each has 1 apple and 1 orange.

$\therefore P = 10 + 7 = 17$

$J = 6 + 4 = 10$

$\therefore$ A isn't Pareto efficient.

B: $P = 11$

$J = 7$

not Pareto efficient (beaten by each having 1 apple & 1 orange)

C: $P = 7$

$J = 11$

not Pareto efficient.

Consider Peter (apple)

John 1 apple 2 orange

$\therefore P = 10$

$J = 6 + 4 + 3 = 13$

D: $P = 10 + 7 + 4 = 21$

$J = 6$

Pareto efficient!

Check all combinations. You will not find one that makes one player better off without making the other worse!