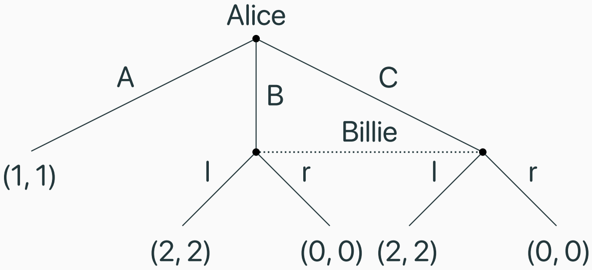
444 Lecture 7.1 - Bayesian Equilibrium

Brian Weatherson

What is Rational Here?



- Intuitively we should end up with one of the 2,2 outcomes.

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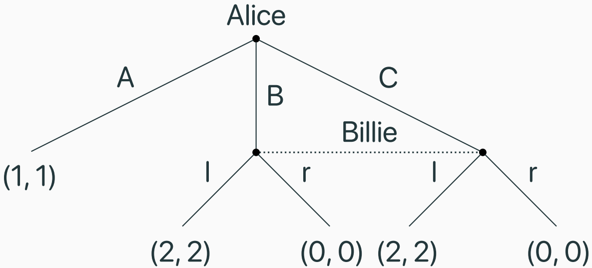


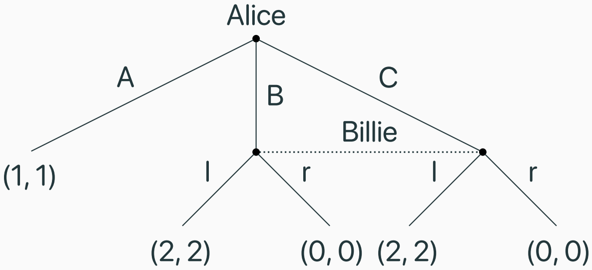
- Intuitively we should end up with one of the 2,2 outcomes.
- But how theoretically can we get that?

Strategy Table

	l	r
A	1, 1	1, 1
B	2, 2	0, 0
C	2, 2	0, 0

Note that $\langle A, r \rangle$ is a Nash equilibrium.

Subgame Perfection



- There are no subgames (think about why) - so $\langle A, r \rangle$ is also subgame perfect.

Intuition

- It is absurd for Billie to play r if it gets that far.
- We need a theory that says this is absurd.
- This is just the kind of thing subgame perfect equilibrium was introduced for, but it isn't working for technical reasons about the definition of subgames.
- I'm not sure if there is a completely standard solution here, but I wanted to set out an approach that's consistent with current philosophy.

Bayesian Equilibrium

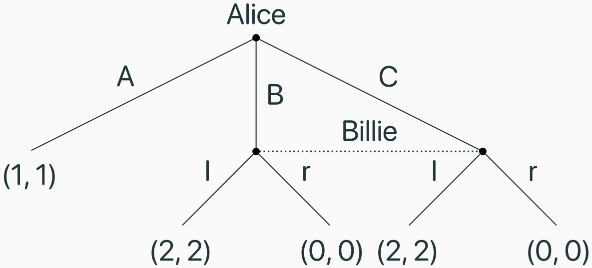
- An equilibrium is a pair of behavioral dispositions.
- Each behavioral disposition gives a probability of each choice at each node the player may have to choose at.
- In equilibrium, each player has their own disposition from the pair, and believes (with certainty) that the other player has the other disposition from the pair.
- If there is a move made by Nature, each player has the correct probability for each of Nature's possible moves.
- At every stage, each Player maximises expected utility given their beliefs about the other.

Re-formulation

This is more or less equivalent.

- Each player starts with a probability distribution over outcomes of the game.
- In equilibrium, these are the same, and the players have correct probabilities about the moves nature will make.
- When something happens (a move is revealed), the players update by conditionalisation if the event has positive probability.
- When something unexpected (probability zero) happens, the players just pick a new probability.
- In equilibrium, both players know how both players are disposed to react in each of these cases.
- Everyone is always maximising expected utility.

Back to the Game



- At the B/C information set, Billie must have some probability between B and C.

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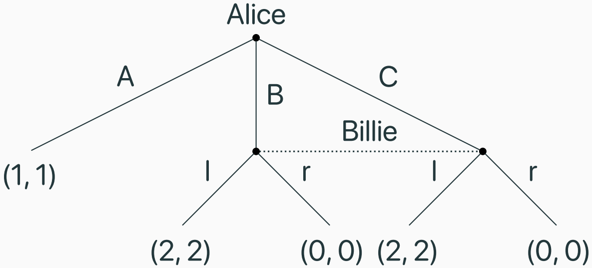

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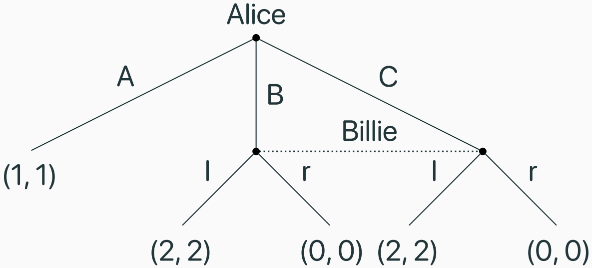

- At the B/C information set, Billie must have some probability between B and C.
- Whatever it is, l has higher expected utility that r.
- Alice knows this, so will choose B or C rather than A.

For Next Time

- I'll look at two puzzle cases.
- If you're pressed for time, skip ahead to the following lecture.