

1. Consider the following two-period game: In the first period Alice and Bob play the stage game

		Bob	
		c	d
Alice	C	(5,5)	(0,8)
	D	(8,0)	(1,1)

At the end of the first period Bob and Alice learn each other's first period choices. In the second period Alice and Bob play the stage game:

		Bob	
		l	r
Alice	H	(8,5)	(0,0)
	L	(0,0)	(1,1)

Alice's payoff from the two-period game equals $\pi_1^{\text{Alice}} + \delta\pi_2^{\text{Alice}}$ where π_1^{Alice} is her payoff from the first-period game, π_2^{Alice} is her payoff from the second-period game and δ is a discount factor that satisfies $0 \leq \delta \leq 1$, and similarly for Bob.

- (a) Find the extensive form representation for this game.
- (b) Find the strategic form representation for this game.
- (c) Identify all pure strategy Nash equilibria in the strategic form representation for values of $\delta = 0$ and $\delta = 1$.
- (d) A subgame in the extensive form is any part of the extensive form that is an extensive form game in its own right, i.e. starts with an initial node (that does not belong to a nontrivial information set) etc. How many subgames are there in the extensive form of the two-period game?

- (e) A subgame-perfect Nash equilibrium induces a Nash equilibrium in every subgame. Find all pure-strategy Nash equilibria when $\delta = 1$.
 - (f) What is the smallest value of δ for which mutual cooperation in the first period is part of a subgame-perfect Nash equilibrium?
 - (g) Use this game to discuss the importance of the future for sustaining cooperation in a society.
2. Analyze the language-game that was introduced in class when the probability of each state is equally likely:
- (a) Find the extensive form.
 - (b) Find the strategic form.
 - (c) How many subgames are there?
 - (d) Find all pure-strategy Nash equilibria.
 - (e) For the dynamic process introduced in class, discuss the outcomes that are likely be observed in the long run.
 - (f) What is the significance of the last observation for the problem of the emergence of conventions?
 - (g) Food for thought (not part of the homework, but instructive if you find the time to do it): What if there are three or more possible messages? What does our dynamic process lead to now?