

# Practice problem set 7

## Dynamic games

This problem set constitutes recommended material for the relevant lab. The choice of tasks to be presented instructionally in every lab is in the discretion of the individual teacher. Students are expected to work on practice problems, however, are not required to submit written solutions. It is non-negotiable policy in this course to not provide hand-outs with the solutions of practice problem sets.

1. Player 1 and player 2 simultaneously select a strategy from the following bi-matrix and immediately receive their payoffs. Then, a coin is tossed: if the coin comes heads up the game is terminated; if the coin comes tails up the same exact game is repeated. The repetition of the game will keep occurring and the players will keep accumulating payoffs till the coin comes heads up in the end of some round. Because rounds repeat instantaneously, discount is practically zero. Explain if the cooperative outcome can be sustained for  $s > 10$ .

P1 \ P2	L	R
T	1, 1	s, 0
B	0, s	10, 10

*End-semester 1 exam – December 2015*

2. Firm 1 and firm 2 have one job opening each and they offer wages  $w_1$  and  $w_2$  such that  $w_0 < 0.5w_1 < w_2 < 2w_1$ . There are two risk-neutral workers, each of whom can apply to only one firm. Workers will simultaneously decide to which firm they will apply. If only one worker applies to a given firm, that worker gets the job; if both workers apply to the same firm, one worker is hired at random with probability 50% and the other worker receives  $w_0$ .
  - (a) Find the NE in pure strategies in the game that the two workers play.
  - (b) Is there a NE in mixed strategies?
  - (c) How does the spread between  $w_1$  and  $w_2$  affect the NE in this game?

*End-module 1 test – October 2016*

3. Consider the following game between player 1 and player 2. (hints: Payoffs in the parentheses: Before the comma is the payoff for player 1 and after the comma the payoff for player 2. Subscripts refer to the stage). (25 points)
  - At stage 1, player 1 can select  $L_1$ , where the game is terminated with payoffs (1, 1) or  $R_1$  which allows player 2 to make a choice at stage 2.
  - At stage 2, player 2 can select  $L_2$ , where the game is terminated with payoffs (2, 2) or  $R_2$  which allows player 1 to make a choice at stage 3.
  - At stage 3, player 1 can select  $L_3$ , where the game is terminated with payoffs (4, 1) or  $R_3$  which allows player 2 to make a choice at stage 4.
  - At stage 4, player 2 can select  $L_4$ , where the game is terminated with payoffs (2, 0) or  $R_4$ , where the game is terminated with payoffs (3, 2).
  - (a) What type of game is the game at hand?
  - (b) Name the method you have to use to solve this game.
  - (c) Find the equilibrium for this game.
  - (d) Name and define the equilibrium notion you have used in (c).
  - (e) In this game players move sequentially. Does the fact that player 1 moves first give him an advantage?
  - (f) Provide the intuition behind your answer in (e).

*1<sup>st</sup> Module – Fall 2012*

4. Consider the following sequential game between player 1 who plays first and player 2.

P1 \ P2	L	R
T	8, 5	4, 3
B	1, 2	6, 7

If P2 had a method that could permanently reduce his own payoff by  $x$  units for only the strategy L, would he want to use this method before the game?

*End-module 1 test – October 2015*

5. A prisoner's dilemma game is played by 2 players. The game will last for  $n$  rounds and then the interaction between the two players will be terminated forever. Player A believes that the game will last for  $k$  rounds. Player B believes that the game will last for  $r$  rounds. Both players know each-other's beliefs but they think their assessment is the right one. Explain under what circumstances a collusive outcome can be sustained in the first period.

*Semester 1 Exam – 2014*

6. Complete the payoffs in the game below, so that the incumbent, who plays second, will want to threaten the entrant that she will play X if he enters but this threat will be empty.

		Incumbent	
		X	Y
Entrant	Enter	,	,
	Pass	,	,

*End-module 2 Exam – December 2016*