EC204 Micro II Spring 2020

HW1 2020/01/29
Liuyi Ye

1. Consider the following games where player 1 is the row player and player 2 is the column player. Apply the iterated deletion of dominated strategies. Show clearly in what order you have deleted and why.

(a)

	a	~~b~~ 3	~~c~~ 4	
A	2,12	1,10	1,11	
~~B~~	~~0,12~~	~~0,10~~	~~0,11~~	1
~~C~~	~~0,12~~	~~0,10~~	~~0,13~~	2

First we delete player 1's strategy B and C - because B are C are strictly dominated by A.
Then delete player 2's strategy b and c - because b and c are strictly dominated by a

(b)

	a	~~b~~ 2	~~c~~ 3	
A	1,1	−2, 0	4, −1	
~~B~~	~~0,3~~	~~3,1~~	~~5,4~~	1
C	1,5	4,2	6,2	

First we delete player 1's strategy B since B is strictly dominated by C.
Then we delete player 2's strategy b and c since they are strictly dominated by a

(c)

	~~N2~~ 1	C2	~~J2~~ 3	
~~N1~~	~~73,25~~	~~57,42~~	~~66,32~~	4
~~C1~~	~~80,26~~	~~35,12~~	~~32,54~~	2
J1	28,27	63,31	54,29	

First we delete player 2's strategy N2 because N2 is strictly dominated by J2.

Then we delete player 1's strategy C1 because C1 is strictly dominated by C2 N1 and J1
Again we delete player 2's strategy J2 because J2 is strictly dominated by C2
Finally delete player 1's strategy N1 because N1 is strictly dominated by J1

2. Consider the following game. 20 players each choose an integer between 0 and 100. The person closest to one-third of the average of all the choices gets $100, others get nothing. The prize is split evenly if there are ties. Proceed by successive deletion of weakly dominated strategies. What is the solution of this game?

The solution of this game is that all players choose 0 by deletion of weakly dominated strategies.
Any choice of number in the interval {34, 100} is weakly dominated because it cannot possibly be 1/3 of the average of any guess. After one step of elimination, we assume all players select numbers in the interval {0, 33}. After K steps the set of intergers is {0, 1…K}. We keep doing this deletion until we end up with a set in which only one number exist. So the process terminates when all players choose to play 0.

3.

Player 2

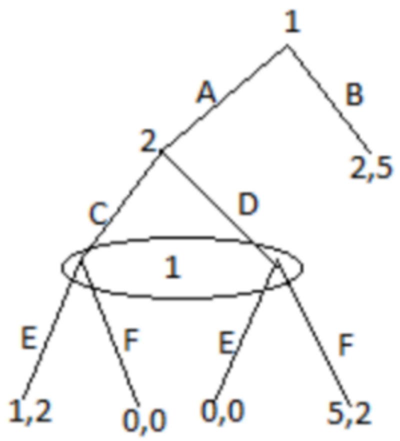
Player 1		H	L
	H	40000, 40000	16000, 45000
	L	45000, 16000	27000, 27000

a. The payoff matrix is in the graph.
   The profits per product are $8 and $3 at high price and low price respectively
   The amount of products one company can sell is: 5000 when the two companies both sell at a high price, 9000 when two companies both sell at a low price, 15000 when this company sells at a low price and the other company sell at a high price, 2000 when this company sells at a high price and the other company sell at a lower.

   So the profit a company make is
   5000*8 = 40000 (HH), 9000*3 = 27000 (LL), 15000*3 = 45000 (LH), 2000*8 = 16000 (HL)

b. Derive the equilibrium set of strageies.
   Answer: The equilibrium is (Low, Low) with payoffs (27000, 27000)
c. Explain why this is an example of the prisoners' dilemma game.
   First, both players have a dominant strategy, L. Each individual player is motivated to take the competitive choice because this choice leads to a higher payoff regardless of the other's move. However, this equilibrium outcome gives the lowest payoffs. Second, if both players play H, they are both better off.

4. Consider the extensive form game below. (a) Assume a behavioral strategy of player 1 over each of her information sets. Show that there is a corresponding outcome-equivalent mixed strategy over her pure strategies. (b) Now assume a mixed strategy for player 1. Show that there is a corresponding outcome-equivalent behavioral strategy.



First notice that strategy space for Player 1 is {AE, AF, BE, BF}

(a) Assume a behavior strategy for Player 1.
Player 1 randomizes between A and B at the first decision node with probability p and (1 -p) respectively, and randomizes between E and F at the second information set with probability q and (1 – q) respectively. p and q are in [0, 1]

Thus, the equivalent mixed strategy for Player 1 is (p*q AE, p*(1-q) AF, (1-p)*q BE, (1-p)*(1-q) BF)

(b) Assume a mixed strategy for Player 1
Player 1 randomize among the four pure strategies {AE, AF, BE, BF}. A mixed strategy for player 1 is (P1*AE, P2*AF, P3*BE, P4*BF), provided that P1+P2+P3+P4 = 1
Thus, the equivalent behavior strategy for Player 1 is that she randomizes between A and B at the first decision note with probability m and (1-m) and randomizes between E and F at the second information set with probability n and (1-n) respectively. m and n are in [0, 1] and they satisfy m*n = P1 , m*(1-n) = P2, (1-m)*n = P3, (1-m)*(1-n) = P4.