Game Theory III Advanced Microeconomics - Pratical Lecture 7

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Last Classes:

(PS5) Static Games with Complete Information

(PS6) Dynamic Games with Complete Information

- Perfect Information
- Imperfect Information

Today's Class: (PS7) Static Games with Incomplete Information

Why Static?

The players choose their action without knowing the action carried out by the remaining players. In fewer words, a game in which every player plays at the same time.

Why with Incomplete Information?

The players **do not know some relevant characteristics of their opponents**, which may include their payoffs, their available options, and even their beliefs.



a) What are the strategies of the players?

a) What are the strategies of the players?

We can also visualize this game using a tree.



Bayesian Nash Equilibrium

Vector of strategies where each player, including each player type, is choosing their best response to the other players' strategies.

(Provided all players know the probabilities of each type occurring)

Procedure to find a BNE

Step 1: Start with the uninformed player and pick a strategy.

Step 2: See the best response of the informed player to the strategy picked in Step 1.

Step 3: See the best response of the uninformed player to the strategy found in Step 2.

Then, we can have two scenarios:

(1) Strategies in Step 1 and Step 3 match \rightarrow We have a BNE.

(2) Strategies in Step 1 and Step 3 don't match \rightarrow We don't have a BNE.

Repeat for all strategies of the uninformed player.

Is there a BNE where Player 1 plays D? (Step 1)

Player 2 is **Nice** (p = 0.5)

1/2	D	с
D	0,-2	-10 , -1
с	-1,-10	-5,-5

Player 2 is Mean (1-p = 0.5)

1/2	D	с
D	0,-2	-10,-7
с	-1,-10	-5,-11

2's best response: CD (Step 2)

Is Player 2 plays CD (from Step 2), then 1's expected payoffs will be... (calculate the expected payoffs of player 1 playing C or D, and compare them).



1's best response to CD: C (Step 3)

Conclusion: The strategies from Step 1 and Step 3 do not match, so there is no BNE where player 1 plays D.

Is there a BNE where Player 1 plays C? (Step 1)

Player 2 is **Nice** (p = 0.5)

1/2	D	с	
D	0,-2	-10 , -1	
с	-1,-10	-5,-5	

Player 2 is Mean (1-p = 0.5)

1/2	D	С
D	0,-2	-10,-7
с	-1,-10	-5,-11

2's best response: CD (Step 2)

Is Player 2 plays CD (from Step 2), then 1's expected payoffs will be... (calculate the expected payoffs of player 1 playing C or D, and compare them).



1's best response to CD: C (Step 3)

Conclusion: The strategies from Step 1 and Step 3 match, so there is a BNE where player 1 plays C.

a) Draw the game tree.

Player 1 is **Strong** (p = 0.5)

1/2	Fight	Acquiesce
Enter	-1,-1	1,1
Not Enter	0,2	0,2

Player 1 is **Weak** (1-p = 0.5)

1/2	Fight	Acquiesce
Enter	-2,0	-1,1
Not Enter	0,2	0,2

Exercise 2 Problem Set 7

a) Draw the game tree.



Is there a BNE where Firm 2 plays Fight? (Step 1)

Player 1 is **Strong** (p = 0.5)

1/2	Fight	Acquiesce
Enter	-1,-1	1,1
Not Enter	0,2	0,2

Player 1 is **Weak** (1-p = 0.5)

1/2	Fight	Acquiesce
Enter	-2,0	-1,1
Not Enter	0,2	0,2

Firm 1's best response: (Not Enter, Not Enter) (Step 2)

Is Player 1 plays (Not Enter, Not Enter) (from Step 2), then 2's expected payoffs will be... (calculate the expected payoffs of player 2 playing Fight or Acquiesce, and compare them).

Player 1 is Strong (p = 0.5)		Player 1 is Weak (1-p = 0.5)				
1/2	Fight	Acquiesce		1/2	Fight	Acquiesce
Enter	-1,-1	1,1		Enter	-2,0	-1,1
Not Enter	0,2	0,2		Not Enter	0,2	0,2

2's best response to (Not Enter, Not Enter): Both Fight and Acquiesce (Step 3)

Conclusion: The strategies from Step 1 and Step 3 do match, so there is a BNE where Firm 2 plays Fight.

Is there a BNE where Firm 2 plays Acquiesce? (Step 1)

Player 1 is **Strong** (p = 0.5)

Player 1 is Wea	k (1-p = 0.5
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Fight

-2,0

0,2

Acquiesce

-1,1

0,2

1/2	Fight	Acquiesce	1/2
Enter	-1,-1	1,1	Enter
Not Enter	0,2	0,2	Not Ente

Firm 1's best response: (Enter, Not Enter) (Step 2)

Is Player 1 plays (Enter, Not Enter) (from Step 2), then 2's expected payoffs will be... (calculate the expected payoffs of player 2 playing Fight or Acquiesce, and compare them).

Player 1 is Strong (p = 0.5)		Player 1 is Weak (1-p = 0.5)				
1/2	Fight	Acquiesce		1/2	Fight	Acquiesce
Enter	-1,-1	1,1		Enter	-2,0	-1,1
Not Enter	0,2	0,2		Not Enter	0,2	0,2

2's best response to (Enter, Not Enter): Acquiesce (Step 3)

Conclusion: The strategies from Step 1 and Step 3 do match, so there is a BNE where Firm 2 plays Acquiesce.

Feedback - Classes T202 and T206

