

Problem Set 9

Dynamic Games

Due: 11PM Eastern Time on Sunday, November 10th

Econ 316: Industrial Organization

Honor code

I am allowed to discuss the problem sets with others. However, I will write everything I submit, such as code, mathematical derivations, and final answers. I will not copy others. When I receive advice from others, I will cite them in my problem set.

For example, if student named “Juana Diaz” gave me advice on a line of code, I will write “(Received advice from Juana Diaz)” on that line. Receiving advice does not affect your grade or how the grader thinks of you.

Question 0

0A: I followed the honor code on this problem set. (Answer Yes or No.)

0B: How much time did you spend on this problem set?

Question 1: Simultaneous vs. Sequential Games

Two firms are setting prices. Each can set price \$6, \$7, \$8, or \$9. The payoffs from each action are:

		Firm 2			
		\$6	\$7	\$8	\$9
Firm 1	\$6	24, 24	30, 25	36, 20	42, 12
	\$7	25, 30	32, 32	41, 30	48, 24
	\$8	20, 36	30, 41	40, 40	50, 36
	\$9	12, 42	24, 48	36, 50	48, 48

- A) What is the Nash equilibrium if the firms set prices simultaneously?
- B) Imagine that this is now transformed to a sequential game in which Firm 1 plays first, then Firm 2 plays second. What is the subgame perfect Nash equilibrium?
- C) Explain why the first mover of a sequential move 2 person game can never be worse off than when the game is played simultaneously. How about the second mover?

Question 2: N-Firm Cournot with Entry

N firms compete in a simultaneous Cournot game. Demand is $Q = 100 - 2P$. Marginal cost is \$10 for all firms. Fixed cost of entry is \$5 for all firms.

Question 3A: What are equilibrium quantities and profits (after subtracting fixed costs) for each firm if $N=2$?

Question 3B: What are equilibrium quantities and profits for each firm if $N=3$?

Question 3C: What are equilibrium quantities and profits for each firm as a function of N ?

Question 3D: Imagine that there are an infinite number of potential entrant firms. Consider a two-stage game where in stage 1, potential entrant firms decide whether or not to enter, and in stage 2, the actual entrant firms play a simultaneous Cournot game. If a potential entrant does not enter in stage 1, it earns zero profit. How many firms will actually enter in equilibrium?

Question 3E: One way that businesses increase profits is to lobby politicians to set up regulations that deter entry of new firms. Imagine that $N=2$, and an “industry association” representing the two firms can pay politicians to pass a law that prohibits any entry by additional firms. In the absence of the law, the equilibrium in Question 3D would arise. What is the maximum amount that the industry association would be willing to pay politicians to pass the law?