

Problem Set 7

Game Theory and Cournot

Due: 11PM Eastern Time on Monday, October 20th

Econ 316: Industrial Organization

To turn in this problem set:

- Email to submit.io.psets@gmail.com

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.)

Yes.

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

Question 1

Consider a simultaneous move game where two identical firms with constant marginal costs set quantities of a homogeneous product. In this question, firms cannot choose any quantity they want. Instead, they can choose one of two quantities:

- Action "Collude" refers to playing half the quantity that a monopolist would choose.
- Action "Compete" refers to playing the Nash equilibrium quantity from the Cournot game.

The payoffs have the following structure:

- Both firms would prefer {Collude, Collude} over {Compete, Compete}.
- But Collude is a dominated strategy.

The normal form is below, with letters (A, B, C, D, a, b, c, d) representing profits.

		Player 2	
		Collude	Compete
Player 1	Collude	A,a	C,c
	Compete	B,b	D,d

Question 1A: Using the above structure, put A, B, C, and D in order from largest to smallest.

Question 1B: What inequalities must a, b, c, and d satisfy given the above structure?

Question 1C: What kind of game is this? Matching pennies, prisoner's dilemma, battle of the sexes, coordination, chicken, or something else?

Question 2

Two firms compete in a simultaneous Cournot game, i.e. they simultaneously set quantities q_1 and q_2 to maximize profits. Inverse demand is $P=300-2Q$, where market quantity Q is $Q=q_1+q_2$.

Case 1: Each firm has marginal cost = 50.

Question 2A: Derive and draw the best response functions of firms 1 and 2

Question 2B: What are equilibrium quantities?

Question 2C: What are equilibrium profits?

Case 2: Imagine that Firm 1 can upgrade its factory to reduce marginal cost to 40.

Question 2D: Derive and draw the best response functions

Question 2E: What are equilibrium quantities?

Question 2F: What are equilibrium profits?

Question 2G: How much should Firm 1 be willing to pay for the factory upgrade?