Exercises Industrial Organization

Prof. Ester Manna

Game Theory and the Cournot Model

1. In the following game, what strategies survive iterated elimination of strictly dominated strategies? What are the pure-strategy Nash equilibria?

		Player 2		
		L	C	R
Player 1	U	2,0	1,-1	4,2
	M	3,4	1,2	2,3
	D	1,3	0,2	3,0

2. Consider the following strategic form representation of a simultaneous move game:

		Player 2		
		L	C	R
Player 1	U	0,2	3,1	4,3
	M	2,4	0,3	3,2
	D	1,1	2,0	2,1

   (a) Is there a dominant strategy for either of the two agents?

   (b) Which strategies can always be eliminated because they are dominated?

   (c) Which strategies can be eliminated if it is common knowledge that both players are rational?

   (d) What are are Nash equilibria in pure strategies?

3. Consider the following strategic form representation of a simultaneous move game:

		Player 2		
		L	C	R
Player 1	U	0,2	2,0	3,1
	M	2,0	0,2	3,1
	D	1,3	1,3	4,4

   (a) Identify the best response for each of the players.

   (b) What are are Nash equilibria in pure strategies?

4. A taxpayer has income y that should be reported in full to the tax authority. There is a flat (proportional) tax rate γ on income. The reporting technology means that the tax payer must report income in full or zero income. The tax authority can choose whether or not to audit the taxpayer. Each audit costs an amount ϕ and if the audit uncovers under-reporting then the taxpayer is required to pay the full amount of tax owed plus a fine F. Suppose that $\gamma y - \phi + F > 0$.

   (a) Set the problem out as a game in strategic form where each agent (taxpayer, tax authority) has two strategies.

   (b) Explain why there is no simultaneous move in pure strategies.

5. Consider the following game depicting the process of standard setting in high-definition television (HDTV). The United States and the Japan must decide simultaneously whether to invest a high or a low value into HDTV research. Each country's payoffs are summarized in the following table:

		Japan	
		Low	$High$
United States	Low	4,3	2,4
	$High$	3,2	1,1

   (a) Are there any dominant strategies in this game?

   (b) What is the Nash equilibrium of the game?

6. The inverse market demand for fax paper is given by

$$P = 400 - 2Q$$

There are two firms who produce fax paper. Each firm has a unit cost of production equal to 40 and they compete in the market in quantities. That is, they can choose any quantity to produce, and they make their quantity choices simultaneously.

(a) What are firms' profits in equilibrium?

(b) What is the monopoly output, i.e. the one that maximizes total industry profit?

(c) What is the output under perfect competition?

(d) Compare the results found in points a, b and c.

7. Consider a duopoly for a homogeneous product with demand

$$Q = 10 - \frac{p}{2}$$

Each firm's cost function is given by

$$TC = 10 + q(q + 1)$$

(a) Determine the values of the Cournot equilibrium.

(b) What is the monopoly output?

(c) Compare the results found in points a and b.

8. Consider a market for a homogeneous product with inverse demand given by

$$P = 50 - 2Q$$

There are two firms. The total cost function is $TC = 10 + 2q_i$ for each firm.

(a) Determine output and price under a Cournot equilibrium.

(b) Compute the efficiency loss as a percentage of the efficiency loss under monopoly.