

MICROECONOMICS 2009/10

GAME THEORY AND SOME APPLICATIONS

1. Imagine a game when there is only one Nash-equilibrium. Assume that our rival is NOT using a Nash equilibrium strategy (that is, his best reply). Should we use our Nash-equilibrium strategy?

2. Two TV channels compete for the audience on Saturday's night. Every channel has two programs that can be set up either from 9-10 or from 10-11. The combination of their decisions can be summarized in the following normal form game (the payoffs are media shares, in percentages)

1/2	9-10	10-11
9-10	18,18	23,20
10-11	30,23	16,16

- (a) Find the Nash equilibria when both firms decide simultaneously
- (b) Has any player a dominant strategy?
- (c) Which would be the equilibrium if channel 1 chose first?

3. The following matrices represent different games between two agents. Find the Nash equilibria

1 / 2	L	R
U	7, 3	1, 2
D	6, 4	2, 6

1 / 2	L	C	R
U	4, 3	2, 7	0, 4
D	5, 5	5, -1	-4, -2

4. An Industry is composed by two firms with the following production costs, $c_1(q_1) = 40q_1$ and $c_2(q_2) = 50q_2$. The demand is $Q=200-p$ where $Q=q_1+q_2$. The firm is known to be the leader of the market. This means that this firm is the first to decide the level of production. Once the leader has decided the level of production, the firm 2, known to be the follower, observes firm 1's production and decides his own production level.

- (a) Solve the problem of the follower and find his reaction function
- (b) Solve the leader's problem, assuming that the leader takes into account the follower's reaction function.
- (c) Find the firm's quantities, the price and profits for each firm.

5. (Cournot) Assume a duopoly with the following costs functions

$$c_1(q_1) = 30q_1 + 10$$

$$c_2(q_2) = 20q_2^2 + 5$$

The aggregate demand is $p(q)=50-2q$ where $q= q_1+q_2$

- (a) Find the Nash-Cournot equilibrium
- (b) Find both price and quantities if the firms decide to collude
- (c) Assume now that both firms agree to produce according to the collusion. If firm 1 thinks firm 2 will hold the agreement, which is the level of production that maximizes firm 1's profits?

6. (Bertrand). Assume a duopoly where firms compete in prices and where goods are differentiated.

To be precise, every firm faces the following demands:

$$q_1 = a - p_1 + bp_2$$

$$q_2 = a - p_2 + bp_1$$

If both firms have similar costs, that is to say, $C(q_i) = cq_i$ for $i=1, 2$, then find prices, quantities and optimal profits when firms compete à la Bertrand.