

MIC (VB): Exercise 2, Nov 2008,

1. Consider the following game, involving an incumbent firm (player 1) and a potential entrant (player 2):

i) Nature chooses the incumbent firm to be either a high cost firm (type H), or a low cost firm (type L), where the high cost firm is chosen with probability p . The incumbent observes nature's choice, while the entrant firm does not.

ii) The incumbent chooses a price from the set $\{P_H, P_L\}$. P_H yields a payoff in this stage of 2 to type H of incumbent and 2.5 to type L . P_L yields a payoff in this stage of 0 to type H and 2 to type L . The incumbent's choice has no direct payoff implications for the entrant.

iii) The entrant observes the incumbent's price choice and chooses from the set $\{\text{IN}, \text{OUT}\}$. If the entrant chooses OUT, his payoff is zero and the incumbent's payoff in this stage is 1, for both types of incumbent. If the entrant chooses IN, his payoff is 1 if the incumbent is type H and -1 if the incumbent is type L , and the payoff to both types of incumbent in this stage are zero.

The total payoff to each type of incumbent in this game is given by the sum of payoffs over stages (ii) and (iii). The payoff to the entrant is that which accrues in stage (iii) alone.

a) Set out the extensive form of this game.

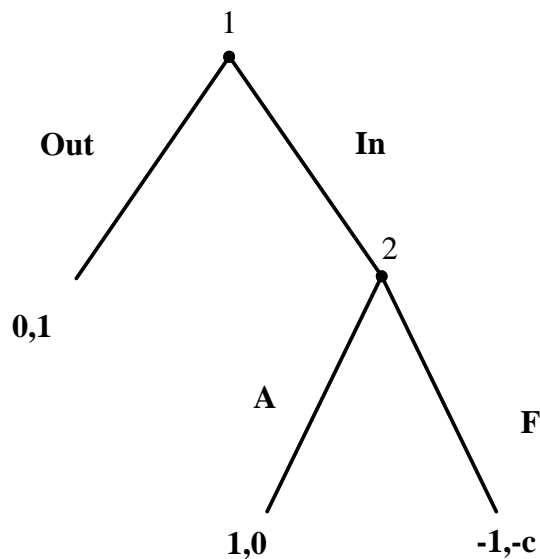
b) Solve (if possible) for a pooling sequential equilibrium of this game, specifying clearly the beliefs of the entrant at each information set.. For what values of p does such an equilibrium exist?

c) Solve for a separating sequential equilibrium of this game, if such an equilibrium exists, setting out the values of p where such an equilibrium exists.

d) Can you use the intuitive criterion to refine any of the equilibria?

2. MWG 9.C.7. In setting out the extensive form, it might be useful to think of nature moving after player 1 has moved, choosing between signals t and b . If player 1 plays T , nature chooses t with probability p . If player 1 plays B , nature chooses b with prob. p .

There seems to be a mistake in the question, so modify the last part of the question as follows: show that there is a unique pure strategy Nash equilibrium. Solve for a mixed strategy Nash equilibrium where player 1 randomizes between T and B . Finally, it is sufficient to consider Nash equilibrium (rather than any refinement). Why?



3. Consider the chain store game, between a long lived incumbent firm and a sequence of entrants. In each period, an entrant, who lives only for one period, must decide whether to enter (IN) or not (OUT). If the entrant enters, the incumbent must choose between accomodation (A) or fight (F). The type of the incument is chosen by nature at the beginning of period one, and reamins fixed thereafter. The incumbent either "normal" or "crazy", where the prior probability of the normal type is p_0 . The entrant's payoffs are common knowledge, the figure shows the stage game payoffs of the entrant and the normal type of incumbent. The crazy type incumbent always chooses F if the entrant enters. The entrant in any period observes the actions taken in all previous periods. The normal type of incumbent maximizes the discounted sum of payoffs over periods.

Assume that p_0 , the prior prob. of the crazy type is less than 0.5, and that $c < \delta$, the discount factor of the incumbent.

a) Write out the full description of the equilibrium when the number of periods equals 2. In particular, what is the total probability that entry is fought at $t = 1$, and how does this affect equilibrium behavior depending upon paramter values

(p_0) .

b) Solve for a sequential equilibrium when the number of periods equals 3, first for the case when $p_0 > 0.25$ and then when $p_0 < 0.25$.

(If you do not fully understand this problem, see Fudenberg and Tirole, Game Theory, chs 8.2.2 and 9.2.1.)