

## EC3014 : GAME THEORY

Practical 4, Dec 2007

1. Consider the following strategic situation, 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  $\pi$ . The incumbent observes nature's choice, while the entrant firm does not (it is common knowledge that the probability of  $H$  is  $\pi$ ).

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  $\{IN, OUT\}$ . 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) For what values of  $\pi$  does this game have a pooling weak sequential equilibrium of this game. Solve for such a pooling equilibrium when it exists, specifying clearly the beliefs of the entrant at each information set. (points)

c) Does this game have a separating equilibrium? If so, solve for a separating weak sequential equilibrium of this game, specifying the beliefs of the entrant at each information set. If not, explain why there is no separating equilibrium.

2. Find the pure strategy weak sequential equilibria of the game "Selten's horse" ( Fig 331.2, Osborne, p 331). To do this, find the pure strategy Nash equilibria, and then determine which is part of a weak sequential equilibrium.