

A Dynamic Oligopoly Game

Consider the following Stackelberg game with two firms and two states of nature. In the high state, the inverse demand function is given by

$$p^H = 120 - q_1 - q_2$$

where p^H is the price and q_i is the quantity supplied by firm i ($i = 1, 2$). In the low state, the inverse demand function is given by

$$p^L = 80 - q_1 - q_2$$

The probability of each state is $\frac{1}{2}$. Assume that production costs are zero.

The timing of moves is the following. Firm 1 moves first and selects its quantity. Then firm 2 chooses its quantity after observing firm 1's quantity. That is, q_2 can be a function of q_1 .

(a) Suppose firm 2 can observe the true state of nature before choosing its quantity, but firm 1 cannot. Calculate the unique subgame perfect Bayesian Nash equilibrium. Be careful to fully specify firm 2's strategy.

(b) Suppose firm 1 can observe the true state of nature before choosing its quantity, but firm 2 cannot. Calculate one weak perfect Bayesian equilibrium (WPBE) of this game. Remember to specify beliefs as well as strategies.

(c) Without doing any calculations, carefully explain the intuition for why there are many WPBE of the game in part (b).