Strategy: An Introduction to Game Theory

Review

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Recap

- Dominant Strategies
- Nash Equilibrium
- Mixed Strategies
- Extensive Form Games
- Bayesian Games
- Bayesian Auctions
- Evolutionary Games
- Repeated Games

Cournot Duopoly

Consider an asymmetric Cournot duopoly game, where the two firms have different costs of production. Firm 1 selects quantity q_1 at a production cost of $2q_1$. The market price is given by $p = 12 - q_1 - q_2$. Firm 2 selects quantity q_2 and pays production cost of $4q_2$. Their payoff functions are: $u_1(q_1, q_2) = (12 - q_1 - q_2)q_1 - 2q_1$ and $u_2(q_2, q_1) = (12 - q_1 - q_2)q_2 - 4q_2$. Find their best response functions and NE.

Watson Ch 10, Ex 7

Extensive Form/ SPE

Consider a game in which player 1 first selects between I and O. If player 1 selects O, then the game ends with payoff vector of (x, 1) where x>0. If player 1 selects I, then this selection is revealed to player 2 and then the players play a BOS game in which they simultaneously and independently choose between A and B. If they coordinate on A, then payoff vector is (3,1). If they coordinate on B, then payoff vector is (1,3). If they fail to coordinate, then payoff vector is (0,0). Represent the game in extensive & normal forms. Find the NE and any SPE there might be (pure strategy).

Watson Ch 15, Ex 7

Bayesian Auction

Suppose you and one other bidder are competing in a private-value auction. The auction format is sealed bid, first price. Let v and b denote your valuation and bid, respectively, and v′ and b′ denote your opponent's valuation and bid. Your payoff is v-b if it is the case that $b \geq b'$. Your payoff is 0 otherwise. Although you do not observe v′, you know that v′ is uniformly distributed over [0,1]. You also know that your opponent bids according to the function $b'(v') = v'^2$. Suppose your value is 3/5. What is your optimal bid?

Watson Ch 27, Ex 2

Bargaining

Two players are trying to divide a pie of size $c = 1$. First, player 1 proposes a division x to player 2 with payoffs (x_1, x_2). If player 2 rejects, he gets to make a counterproposal y with payoffs (y_1, y_2). If player 1 rejects player 2's offer, both get a payoff of zero. The players discount their payoffs by δ_1 and δ_2 in the second period. What is the SPE of the game? Assume $x_1, x_2, y_1, y_2 \in [0, 1]$.

Osborne Ch 16, Ex 16.1.2

Reference Reading

1. ***An Introduction to Game Theory*** by Martin Osborne
2. ***Strategy, An Introduction to Game Theory*** by Joel Watson

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