

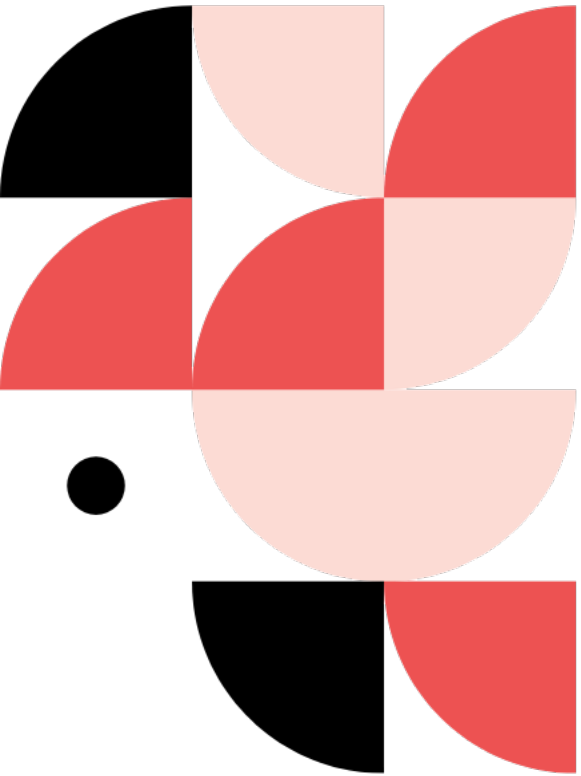
Strategy: An Introduction to Game Theory

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.



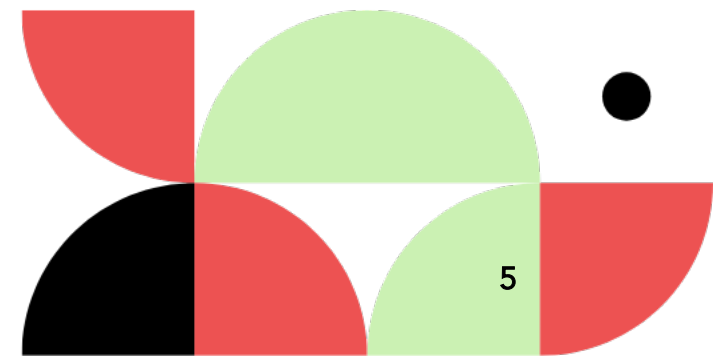
Extensive Form/ SPE



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).

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?



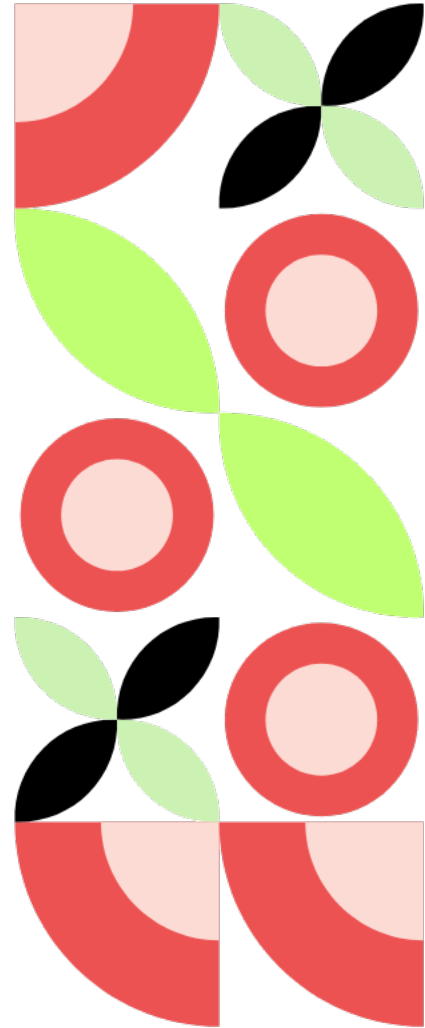
Bargaining

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 $x_1, x_2, y_1, y_2 \in [0, 1]$.



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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