Econ 100A: Intermediate Microeconomic Analysis Lecture 23

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Plan of Today's Lecture

- Ch. 13:
- Game = any situation where players take actions and other players respond / act
  - Players (participants, agents, individuals, firms)
  - Payoffs (value of a possible outcome)
  - Strategy = plan of actions
    - Optimal strategy – expected payoff is maximal
    - Dominant strategy – optimal strategy irrespective of opponents' actions
- Games
  - Cooperative (with binding contracts & joint strategies)
  - Non-cooperative (no contracts are possible)
- Nash Equilibrium
- Repeated games

Gaming and Strategic Decisions

- **Game** = a situation in which *players* (the participants) make strategic decisions
  - Ex: firms competing with each other by setting prices, parent and child, worker and manager
- Strategic decisions result in **payoffs** to the players: Each outcome generates certain rewards or benefits (payoffs)

Strategy and Optimal Strategy

- Game theory = how to determine optimal strategy for each player
- **Strategy** is a rule or plan of action for playing the game
- **Optimal strategy** for a player is one that maximizes the expected payoff
- We consider rational players – they think through their actions

Dominant Strategies

- Dominant Strategy is one that is optimal no matter what an opponent does
  - Example 1
    - Firms A and B sell competing products
    - Both are deciding whether to undertake an advertising campaign
  - Example 2 ?
    - Students A and B are in econ 100A
    - Both are deciding whether to study hard

Dominant Strategies and Equilibrium

- Equilibrium in dominant strategies
  - Outcome of a game in which each firm is doing the best it can regardless of what its competitors are doing
  - Optimal strategy is determined without worrying about the actions of other players
- Not every game has a dominant strategy for each player

The Nash Equilibrium

- A dominant strategy is stable (or self-enforcing), but in many games some players could have no dominant strategy
- A more general equilibrium concept is the **Nash Equilibrium** (introduced in Chapter 12)
  - A set of strategies (or actions) such that each player is doing the best he can given his opponents' actions

The Nash Equilibrium

- None of the players have incentive to deviate from Nash strategy, therefore Nash equilibrium is stable (self-enforcing)
  - In the Cournot model, each firm sets its own price assuming the other firm's outputs are fixed. Cournot equilibrium is a Nash Equilibrium.

The Nash Equilibrium strategy versus Dominant strategy

- Dominant Strategy
  - "I'm doing the best I can no matter what you do. You're doing the best you can no matter what I do."
- Nash Equilibrium Strategy
  - "I'm doing the best I can given what you are doing. You're doing the best you can given what I am doing."
- Dominant strategy is a special case of Nash equilibrium

The Battle of the Sexes (Coordination Game)

		Joan	
		Wrestling	**Opera**
Jim	**Wrestling**	**2,1**	**0,0**
	Opera	**0,0**	**1,2**

Repeated Games

- Repeated games = games, in which actions are taken and payoffs are received repeatedly (over and over again)
- Oligopolistic firms play a repeated game
- An Example: With each repetition of the Prisoners' Dilemma, firms
  - develop reputations
  - study the behavior of their competitors

Pricing Problem

- How does a firm find a strategy that would work best on average?
- Tit-for-tat strategy
  - Repeated game strategy in which a player responds in kind:
    - Cooperate with cooperative opponents
    - Retaliate against uncooperative ones

Tit-for-Tat Strategy

- What if the game is infinitely repeated?
  - Competitors repeatedly set price every month, forever
  - Tit-for-tat strategy is rational
    - If competitor charges low price and undercuts firm
    - Will get high profits that month but know I will lower price next month
    - Both of us will get lower profits if keep undercutting, so not rational to undercut

Tit-for-Tat Strategy in finitely repeated games

- In finitely repeated games:
  - If both firms are rational, they will charge high prices until the last period (for ex. month)
  - After the last month, there is no retaliation possible
  - But in the month before last month, knowing that will charge low price in last month, will charge low price in month before
  - Keep going and see that only rational outcome is for both firms to charge low price every month (this is called backward induction)

Repeated Games and Cooperation

- Conclusion
  - Cooperation is difficult at best since payoffs may change in the long run
  - Need a small number of firms
  - Need stable demand and cost conditions
    - price wars if these conditions do not hold

Threats, Commitments, and Credibility

- Strategic Move = action that gives player an advantage by constraining him
  - What actions can a firm take to gain advantage in the marketplace?
    - Deter entry
    - Induce competitors to
      - reduce output
      - leave
      - raise price
    - Implicit agreements that benefit one firm

Threats, Commitments, and Credibility: Strategic Move

- Strategic Move
  - Action that gives a player an advantage by constraining his behavior
  - Firm 1 must constrain his behavior to the extent Firm 2 is convinced that he is committed
  - LTCM partners: refusal to deal with Buffett was it a strategic move?

Threats, Commitments, and Credibility: Pre-commitment

- How to Make the First Move
  - Demonstrate Commitment
  - Firm 1 must do more than announce they will produce sweet cereal
    - Invest in expensive advertising campaign
    - Buy large order of sugar and send invoice to Firm 2
  - Commitment must be enough to induce Firm 2 to make the decision Firm 1 wants it to make

Threats, Commitments, and Credibility: Empty Threats

- Empty Threats
  - Lecture notes: on line or not on line?
  - Notes exist ➔ it is Pareto Optimal to put them on line

Summary of Today & Plan of Next Lecture

- Ch. 13 material: Games
- Repeated Games
- Threats, Commitments, and Credibility
  - Credible threat
  - Empty threat
- Entry Deterrence
  - Excess Capacity, pre-commitment
- Next lecture:
  - Ch 17 (agency)
  - LTCM