Module 14: Adverse Selection

Information Economics (Ec 515) · George Georgiadis

- Agents have private information - their "type" θ_i.
- Examples:
  - Selling stuff: consumer knows his preference; seller knows quality of product.
  - Regulation natural monopolies: firms know their production cost.
  - Taxing and redistributing income: worker knows productivity or disutility from labor.
  - Credit markets: entrepreneur knows risk of project.
  - Insurance: Insuree knows idiosyncratic risk.
- Asymmetric information can cause inefficiencies:
  - Akerlof: market collapse ("Market for Lemmons")
  - Monopoly pricing: Deadweight loss.
- Mechanism design approach:
  - Principal (usually uninformed) proposes a mechanism (*i.e.*, game form & outcome function).
  - Agent accepts / rejects mechanism.
  - Agents play the game and outcomes are determined.
- Alternative approach: Signaling
  - Informed party proposes contract.
  - In equilibrium, contract proposal signals type.
- Plan of attack:

- Single-agent Problem
- Multi-agent Problem
- Dynamics

Market for Lemmons

- A consumer seeks to buy a used car.
  - Used cars have quality $\theta \in [0, 1]$.
  - We say that θ is the "type" of the car.
- If a seller owns a car of type θ, then his utility from ownership is θ.
  - *i.e.*, he will not sell it for any less than θ.
- A buyer is willing to pay $\frac{3}{2}\theta$ for a car of type θ.
- This implies that it is efficient to sell the car.
  - *i.e.*, buyers get more value from it than sellers.

Benchmark #1: Quality θ is observable to both parties.

- Let $p(\theta)$ be the price of a car with quality θ.
- In equilibrium, $p(\theta) \in \left[\theta, \frac{3}{2}\theta\right]$.
  - At any such price, both parties are happy to trade.
- All cars will be traded, and the market outcome is efficient.

Benchmark #2: Quality θ is not observable to either party.

- Suppose that $\theta \sim U[0, 1]$. Then $\Pr\left\{\theta \leq \bar{\theta}\right\} = \bar{\theta}$.
- In this case, there can only be one price.
  - Price cannot depend on the car's type, since it is unobservable.
- The expected quality of a car is $\mathbb{E}[\theta] = \frac{1}{2}$.

- If the seller keeps his car, his expected utility is: $\mathbb{E}[\theta] = \frac{1}{2}$.
- If the buyer purchases the car, his expected utility is $\mathbb{E}\left[\frac{3}{2}\theta\right] = \frac{3}{4} > \frac{1}{2}$.

- In equilibrium, the price will be $p \in \left[\frac{1}{2}, \frac{3}{4}\right]$.
  - At any such price, both parties are happy to trade.
- Again, all cars will be traded, and the market outcome is efficient.

Adverse Selection (Asymmetric Information)

- Only the seller knows the quality of his own car θ.
- The buyer cannot observe the car's quality.
  - Buyers believe that $\theta \sim [0, 1]$.
- Because all cars look the same to the buyers, there will again be only one price p.
- Given this price, a seller with a car of quality $\theta \in [0, 1]$ will sell if and only if $p \geq \theta$.
- Given price p, we know that the cars for sale will have quality $\theta \leq p$.
  - Quality was uniformly distributed on $[0, 1]$.
  - So the quality of cars for sale will be uniformly distributed on $[0, p]$.
- *Adverse Selection:* the distribution of cars for sale is worse than the original distribution!
  - Only those sellers with a car with quality below p are willing to sell!
  - Sellers with a better car prefer to keep it.
- Because buyers are rational , they will take this into account when deciding the price they are willing to pay.
- What is the equilibrium price p?
  - Fix any $p > 0$.
  - Then, the expected quality of cars for sale is $\mathbb{E}[\theta|\theta \leq p] = \frac{1}{2}p$.
  - If a buyer purchases at this price, his expected utility will be

$$\mathbb{E}\left[\frac{3}{2}\theta|\theta \leq p\right] - p = \frac{3}{4}p - p < 0.$$

- No buyer will be willing to buy at any $p > 0$

- Only equilibrium: $p = 0$, and no cars are sold.
  - Market breaks down completely!

References

Akerlof G.A., (1970), "The Market for Lemons: Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics.*

Board S., (2011), Lecture Notes.

Ortner J., (2013), Lecture Notes.