

Advanced Game Theory

5. Adverse selection and market unraveling

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Today: asymmetric information and bilateral exchanges

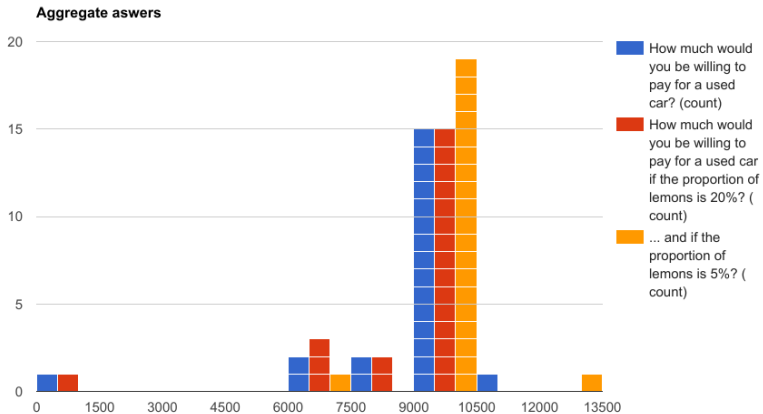
- What happens when one of the parties involved in an exchange has superior information relative to the other?

Example: today's game

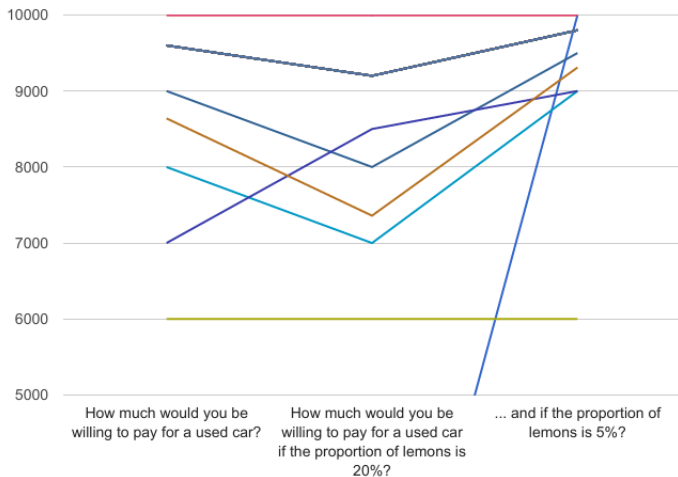
Consider a world with only two kinds of cars, good ones and lemons. An owner knows with certainty which type of car she has, but potential buyers cannot distinguish between the two types. 10% (20%, 5%) of all cars are lemons. Good used cars are worth \$10000 to their owners, but lemons are worth only \$6000. How much are you willing to pay for a car?

- who is informed and who is uninformed?
- what is the problem of the **informed** side?
- what is the problem from the **uninformed** side?

Stats for today's game



Stats for today's game



Main points today

- The **willingness to trade at a given price** is a relevant piece of information that should be used.
- Potentially profitable trades may not occur.
- **Information creates markets** when it reduces the asymmetry of information.
 - ▶ ... which opens profitable business opportunities.

Simple take-over example

Take-over example

- The owner of a company (i.e. the **seller**), who values its company v .
 - ▶ v is uniformly distributed $[0,3000]$,
- A potential **buyer**, who is a better manager and would increase the value of the company by $1/3$.
- Buyer makes a take it-or-leave-it (TOLI) offer to the seller.
 - ▶ The buyer proposes a price,
 - ▶ The seller accepts or rejects,
 - ▶ If the seller rejects there is no trade.

Case 1. No uncertainty

- *Both buyer and seller know v .*
- How much should the buyer offer?
- What is the probability that there is a trade?

Case 2. uncertainty, **symmetric** information

- *Neither buyer nor seller know v , they only know that it is uniformly distributed between $[0,3000]$.*
- How much should the buyer offer?
- What is the probability that there is a trade?

Case 3. **Asymmetric** information: the buyer's inference problem

- *the seller knows the value with certainty, the buyer only knows that v is uniformly distributed between $[0, 3000]$.*
- Suppose the buyer proposes to trade at price x
- If the **seller accepts**.
 - ▶ What should the buyer infer about the value of the company? That it is below x .
 - ▶ Therefore, what is the expected value of the company given that the seller accepts? $\frac{x}{2}$
 - ▶ What is the buyer's payoff? $\frac{x}{2} \cdot \frac{4}{3} - x = -x\frac{1}{3}$
- If the **seller does not accept**:
 - ▶ What should the buyer infer about the value of the company?
 - ▶ What is the seller's payoff as a function of x ? 0

The buyer makes or loses money only if there is trade!

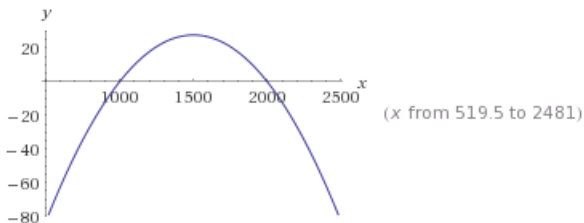
- What value of x should the buyer offer?
- What is the probability that there is a trade?

Takeaway

Asymmetry of information destroys trade opportunities!

Case 4. Asymmetric information (but less asymmetric than before)

- Same as the above problem, but now the buyer believes that the value of the company is uniformly distributed between [1000,3000].
 - ▶ note: the buyer is better informed than before.
- What value of x should the buyer offer?
 - ▶ Expected value of the firm in case of acceptance: $(x + 1000)/2$.
 - ▶ Expected payoff in case of acceptance: $((x + 1000)/2) * (4/3) - x$.
 - ▶ Expected payoff is: $((x + 1000)/2) * (4/3) - x * (x - 1000)/2000$



- Payoff is maximized at $x = 1500$.
- Trade will occur if the true value is below 1500.

Better information increases the probability of a successful trade.

- Question: what if the value of the company is uniformly distributed between $[1000, 2000]$?

Takeaway

Asymmetry of information may destroy trade opportunities!

Providing a bit of information to the uninformed party may restore trade.

Other considerations

- What if the value of the company to the buyer is independent from v_s ?
 - ▶ example: the buyer always values the company 1500 no matter the realization of v_s
- What if the buyer can increase the value of the company by 10?

Can we restore trade?

Ways of restoring trade

- 1 reduce information asymmetry,
- 2 warranties and other contractual arrangements,
- 3 mandating participation into a market (ex. in health insurance),
- 4 signaling (next class).
- 5 screening (next class).

Market creation through information provision

- Transform information **from soft to hard**.
 - ▶ Soft information: difficult to verify or believe.
 - ▶ Hard information: credible and verifiable.
- Example: there are people with spare rooms and others that are willing to rent them out.
 - ▶ (almost) no market before Airbnb; why?
 - ▶ Thriving market with Airbnb; why?
 - ▶ Other examples?

Warranties and other contractual arrangements

Another way of making information hard: *putting the money where the mouth is*.

- the seller will pay a cost in case the product turns out to be of lower quality than expected.
- **Problem:** because it is a *contractual* arrangement, the quality dimension must be measurable by third parties (such as courts).

Mandatory participation

- **Insurance market:** consumers are typically better informed than seller regarding their “type” (i.e. how costly it is to insure them).
- **Adverse selection:**
 - ▶ the most costly “types” will purchase insurance.
 - ▶ the price of the insurance reflects this.
- Force all consumers to participate into the insurance market:
 - ▶ Using taxes (ex. French system).
 - ▶ Using a mandate (ex. Obamacare, Swiss system).

Takeaway points for today

- 1 The willingness to trade of your opponent reveals something about the underlying quality of what has been traded.
- 2 Information asymmetry may destroy profitable trade opportunities.
- 3 Provision of information may create markets (see Airbnb, Uber, ...)

Discussion of today's readings

Administration

- The second problem set will be available today, it is due on Monday 8:25 AM.