Economics of Uncertainty and Information

Introduction

• In this lecture, we will discuss briefly some of the issues that have been at the “frontiers” of economics.
• They concern decisions when there is uncertainty and also issues that arise when some agents are better informed than others.
• Some of this material is in Mankiw, Chapter 22, but most will be in this set of slides.
Information and Uncertainty

Asymmetric information
• Hidden characteristics
• Hidden actions

Some Concepts to Learn

• “Fair” insurance
• Asymmetric Information
• Hidden information or adverse selection
• Hidden actions or moral hazard.
• Types of auctions: First price, Second price, English
• The Lemons Problem.
Asymmetric Information

• Games of **Asymmetric Information** arise when one or more agents in a strategic situation possess better information about a random event than the other agents.

• Examples:
  – Purchasers of insurance are better informed about their health status.
  – Sellers of used cars are better informed about the quality of the vehicle.

*Asymmetric information* is a situation in which one side of an economic relationship has better information than the other.
Hidden characteristics are things that one side of a transaction knows about itself that the other side would like to know but does not.

Hidden actions are actions taken by one side of an economic relationship that the other side of the relationship cannot observe.
Hidden Characteristics in Labor Markets

- High ability workers
- Worth $400 to the firm
- One-half
- Low ability workers
- Worth $200 to the firm
- One-half

Adverse Selection

*Adverse selection* occurs when the uninformed side of a deal gets exactly the wrong people trading with it (i.e., it gets an adverse selection of the informed parties).
Adverse Selection in Insurance

• Suppose a typical car accident involves loss of $10,000
• Two types of drivers
  – High risk -- 40%
  – Low risk -- 20%
• Insurance company wants to charge a different price for high versus low risk drivers.

Adverse Selection in Insurance: Fair Insurance

• The term “fair insurance” refers to an insurance premium that on average repays the insurance company for its losses.
• Fair insurance for high risk agents is $4,000 ($=0.4*10,000), for low risk is $2,000.
• If both types are equally likely, fair insurance for the pool is $3,000 ($=0.5*4,000+0.5*2,000)
• Suppose the insurance company offers insurance at $3,000. What if low risk drivers choose not to buy it?
  – Why wouldn’t they?
  – Are high risk drivers likely to buy?
Ways to Deal With Adverse Selection.

- Discriminate on observed characteristics:
  - 21 year old male driver versus 40 year old female driver.
  - 2007 Ford Mustang Shelby Cobra 500GT versus Honda Odyssey Touring Minivan both around $40K
- Use incentives: Annual premium depends on deductibles for collision and comprehensive
  - $100: $1,952.60
  - $500: $1,559.00
  - $1,000: $1,333.00

The Lemons Problem

- Winners
  - Valued at $1,000
  - 80%
- Lemons
  - Valued at $500
  - 20%
Moral Hazard

*Moral hazard* refers to hidden actions because, in such cases, the informed side may take the ‘wrong’ action.

Moral Hazard

- Hidden actions and moral hazard
  - Medical care, doctor visits.
  - Employment – shirking
  - Insurance: risky driving, car rental.
- Ways to address:
  - Insurance copays
  - “Risk sharing” (eg. Share-cropping, piece rates)
  - Deductibles.
A Special Segment: Game Theory, Asymmetric Information and Auctions

• Auctions have emerged as one of the most important contributions of game theory to market design.

Many items, some important, some minor are sold at auction:

– Government:
  • FCC Spectrum licenses, Energy supply contracts, Oil drilling rights, road construction, school milk.
– Private Sector:
  • Wine, antiques, tobacco, art, used cars, firms.
  • eBay.
Two Main Auction Formats

- First Price Sealed Bid Auction
  - All bidders submit a ‘bid’ or a number in a sealed envelope.
  - Highest bidder gains object and pays price bid.
- Ascending bid, clock or English Auction
  - Price starts low on a clock or from an auctioneer.
  - Bidders indicate willingness to pay at that price.
  - If they say no, they are out of the auction.
  - Auctioneer or clock raises price until only one bidder left.

One other format

- Second Price Sealed Bid Auction:
  - All bidders submit bids in a sealed envelope.
  - Highest bidder obtains object.
  - Pays SECOND highest bid submitted.
- How should you bid?
  - If you are certain of the value to you, bid your value.
  - (Similar to English auction – bid up to your value.)
- Contrast with a first price auction:
  - Bid less than your value. Why?
Game Theory

• Game Theorists have played an important role in describing how these auction games are played.
• They also analyze benefits and drawbacks of these auctions.
• They were a major voice in the process by which the FCC adopted its spectrum auctions:
• See
  • http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=66

An Example: Uncertainty But Symmetric Information

• Suppose you are bidding for a used car.
• With probability 20% it is a lemon and worth $500 to you.
• Otherwise (80% of the time) it is worth $1000.
• Assume you are risk neutral.
• What is the expected value of the car to you?
Expected Value

- The expected value is
- \(0.2 \times 500 + 0.8 \times 1000 = 100 + 800 = $900\).

English Auction

- Suppose that everyone believes, like you, that the car is a lemon with probability 20%.
- How should you bid in an English Auction?
English Auction

• Use backward induction:
• If the current price is $p$, you can either say ‘no’, and leave the auction, or say ‘yes’ and stay.
• Suppose $p>900$. What should you do?
• Suppose $p<900$, What should you do?
• When should you drop out?

Example: Auction with Asymmetric Information – The Lemons Problem

• Suppose you know there is one bidder who knows if the car is a lemon but you do not know who it is.
• That bidder has almost the same VALUE as you do for good and bad cars (1001 and 500).
• What would this bidder do if the car was bad? If it was good?
• When should you drop out?
Example: Auction with Asymmetric Information – The Lemons Problem

- You should drop out as soon as the price reaches $500.
- If you bid higher and beat the informed bidder, you would only win if the car was a lemon and you would end up paying more than it is worth.
- This is an example of what is called ‘the winner’s curse’ in auctions.
- Question: Would good cars ever get sold?
- Made famous by Nobel Prize winner George Akerlof in his ‘Market for Lemons’.

Asymmetric information
  - Hidden characteristics
  - Hidden actions
- Hidden characteristics and adverse selection
  - Employment -- education as a signal
  - Market for lemons