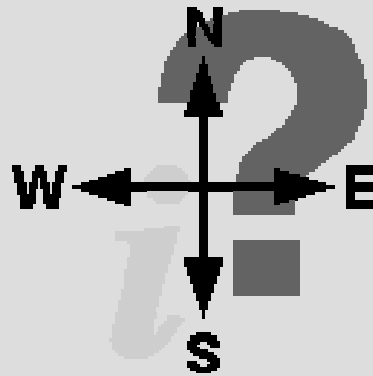


Managerial Economics & Business Strategy

Chapter 12

The Economics of Information



Overview

- I. The Mean and the Variance
- II. Uncertainty and Consumer Behavior
- III. Uncertainty and the Firm
- IV. Uncertainty and the Market
- V. Auctions

The Mean

- The expected value or average of a random variable.
- Computed as the sum of the probabilities that different outcomes will occur multiplied by the resulting payoffs:

$$E[x] = q_1 x_1 + q_2 x_2 + \dots + q_n x_n,$$

where x_i is payoff i , q_i is the probability that payoff i occurs, and $q_1 + q_2 + \dots + q_n = 1$.

- The mean provides information about the average value of a random variable but yields **no** information about the degree of risk associated with the random variable.

The Variance & Standard Deviation

- Variance
 - A measure of risk.
 - The sum of the probabilities that different outcomes will occur multiplied by the squared deviations from the mean of the random variable:

$$s^2 = q_1 (x_1 - E[x])^2 + q_2 (x_2 - E[x])^2 + \dots + q_n (x_n - E[x])^2$$

- Standard Deviation
 - The square root of the variance.

Uncertainty and Consumer Behavior

- Risk Aversion

- *Risk Averse*: An individual who prefers a sure amount of \$M to a risky prospect with an expected value, $E[x]$, of \$M.
- *Risk Loving*: An individual who prefers a risky prospect with an expected value, $E[x]$, of \$M to a sure amount of \$M.
- *Risk Neutral*: An individual who is indifferent between a risky prospect where $E[x] = \$M$ and a sure amount of \$M.

Examples of How Risk Aversion Influences Decisions

- Product quality
 - Informative advertising
 - Free samples
 - Guarantees
- Chain stores
- Insurance

Price Uncertainty and Consumer Search

- Suppose consumers face numerous stores selling identical products, but charge different prices.
- The consumer wants to purchase the product at the lowest possible price, but also incurs a cost, c , to acquire price information.
- There is *free recall* and with *replacement*.
 - *Free recall* means a consumer can return to any previously visited store.
- The consumer's reservation price, the at which the consumer is indifferent between purchasing and continue to search, is R .
- When should a consumer cease searching for price information?

Consumer Search Rule

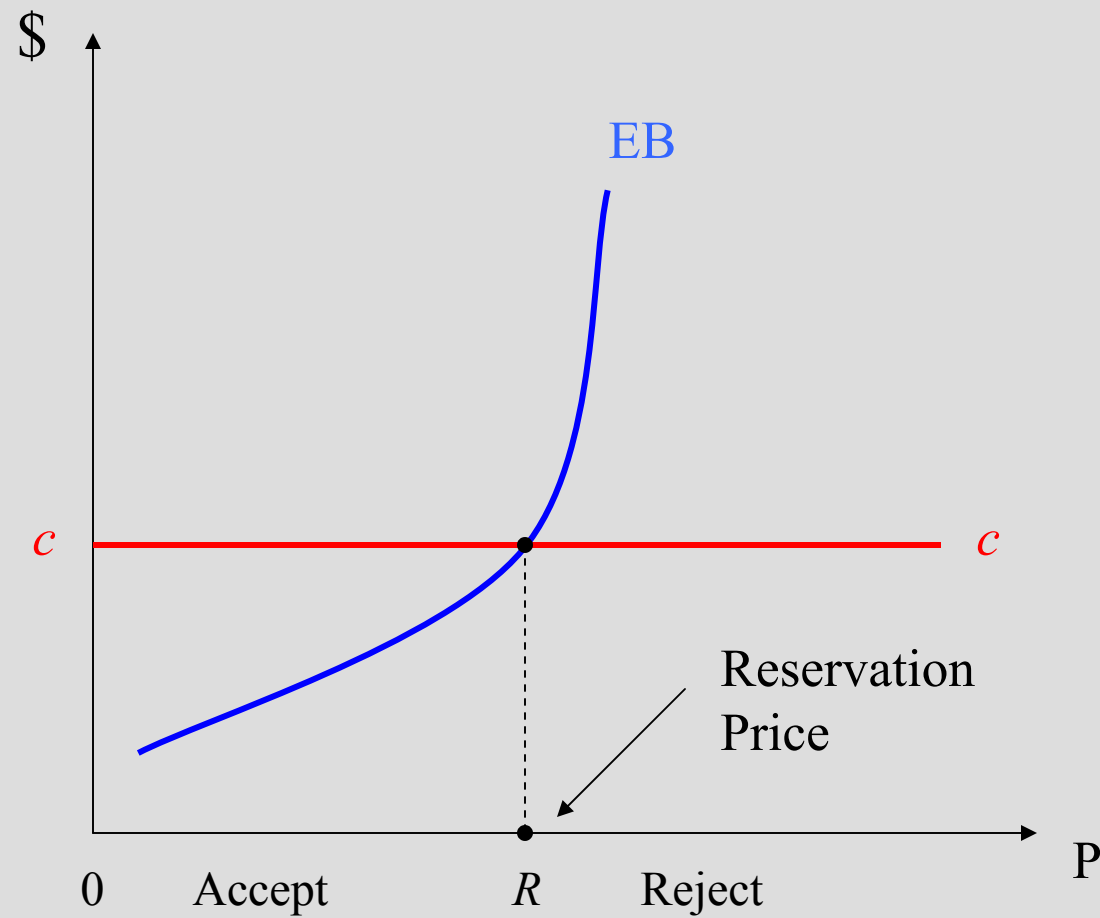
- Consumer will search until

$$EB(R) = c.$$

- Therefore, a consumer will continue to search for a lower price when the observed price is greater than R and stop searching when the observed price is less than R .

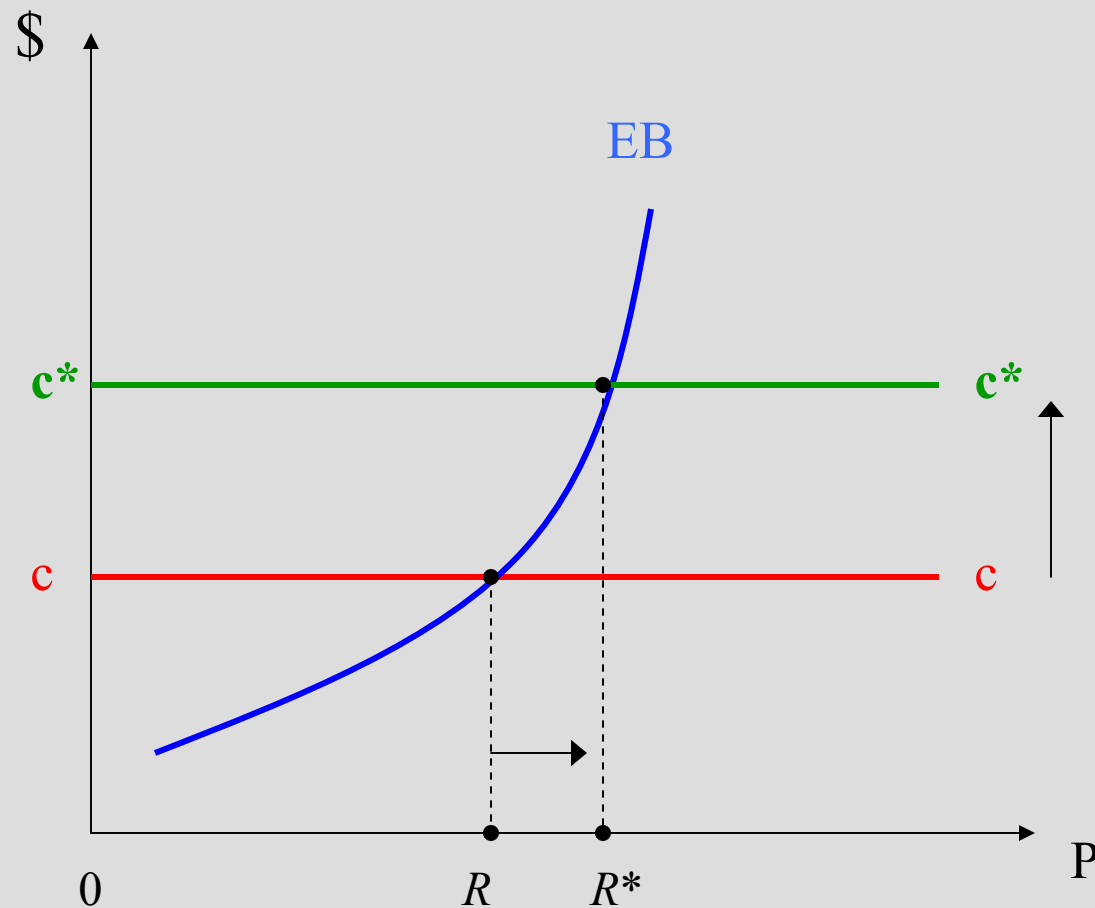
Consumer Search

The Optimal Search Strategy.



Consumer Search: Rising Search Costs

An increase in search costs raises the reservation price.



Uncertainty and the Firm

- Risk Aversion
 - Are managers risk averse or risk neutral?
- Diversification
 - “Don’t put all your eggs in one basket.”
- Profit Maximization
 - When demand is uncertain, expected profits are maximized at the point where expected marginal revenue equals marginal cost: $E[MR] = MC$.

Example: Profit-Maximization in Uncertain Environments

- Suppose that economists predict that there is a 20 percent chance that the price in a competitive wheat market will be \$5.62 per bushel and an 80 percent chance that the competitive price of wheat will be \$2.98 per bushel. If a farmer can produce wheat at cost $C(Q) = 20 + 0.01Q$, how many bushels of wheat should he produce? What are his expected profits?
- Answer:
 - $E[P] = 0.2 \times \$5.62 + 0.8 \times \$2.98 = \$3.508$
 - In a competitive market firms produce where $E[P] = MC$. Or, $3.508 = 0.01Q$. Thus, $Q = 350.8$ bushels.
 - Expect profits = $(3.508 \times 350.8) - [1000 + 0.01(350.8)] = 1230.61 - 1000 - 3.508 = \227.10 .

Asymmetric Information

- Situation that exists when some people have better information than others.
- Example: Insider trading

Two Types of Asymmetric Information

- Hidden characteristics
 - Things one party to a transaction knows about itself, but which are unknown by the other party.
- Hidden actions
 - Actions taken by one party in a relationship that cannot be observed by the other party.

Adverse Selection

- Situation where individuals have hidden characteristics and in which a selection process results in a pool of individuals with undesirable characteristics.
- Examples
 - Choice of medical plans.
 - High-interest loans.
 - Auto insurance for drivers with bad records.

Moral Hazard

- Situation where one party to a contract takes a hidden action that benefits him or her at the expense of another party.
- Examples
 - The principal-agent problem.
 - Care taken with rental cars.

Possible Solutions

1. Signaling

- Attempt by an informed party to send an observable indicator of his or her hidden characteristics to an uninformed party.
- To work, the signal must not be easily mimicked by other types.
- Example: Education.

Possible Solutions

2. Screening

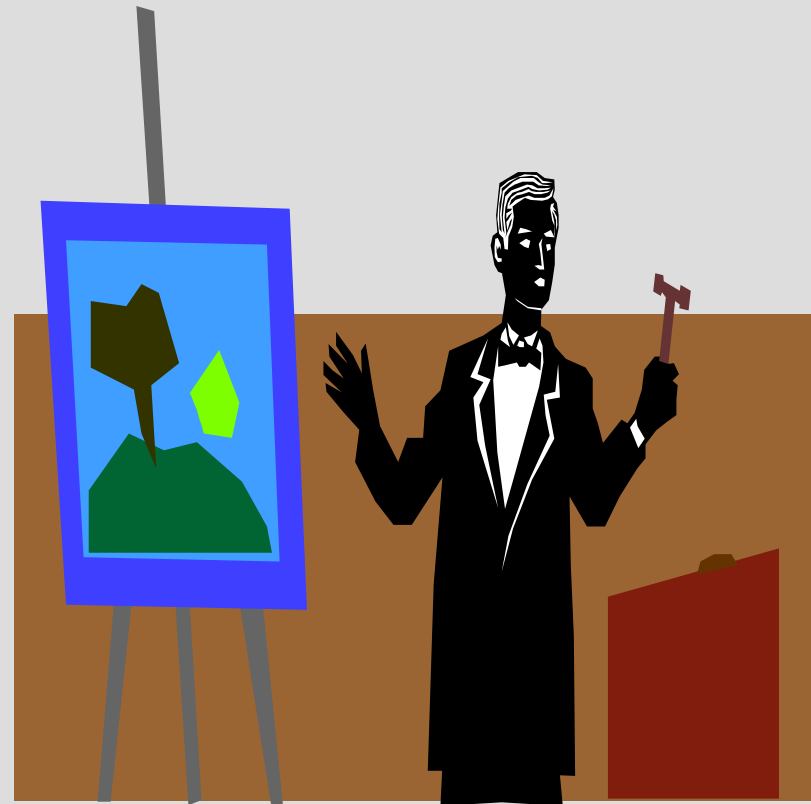
- Attempt by an uninformed party to sort individuals according to their characteristics.
- Often accomplished through a *self-selection device*
 - A mechanism in which informed parties are presented with a set of options, and the options they choose reveals their hidden characteristics to an uninformed party.
- Example: Price discrimination

Auctions

- Uses
 - Art
 - Treasury bills
 - Spectrum rights
 - Consumer goods (eBay and other Internet auction sites)
 - Oil leases
- Major types of Auction
 - English
 - First-price, sealed-bid
 - Second-price, sealed-bid
 - Dutch

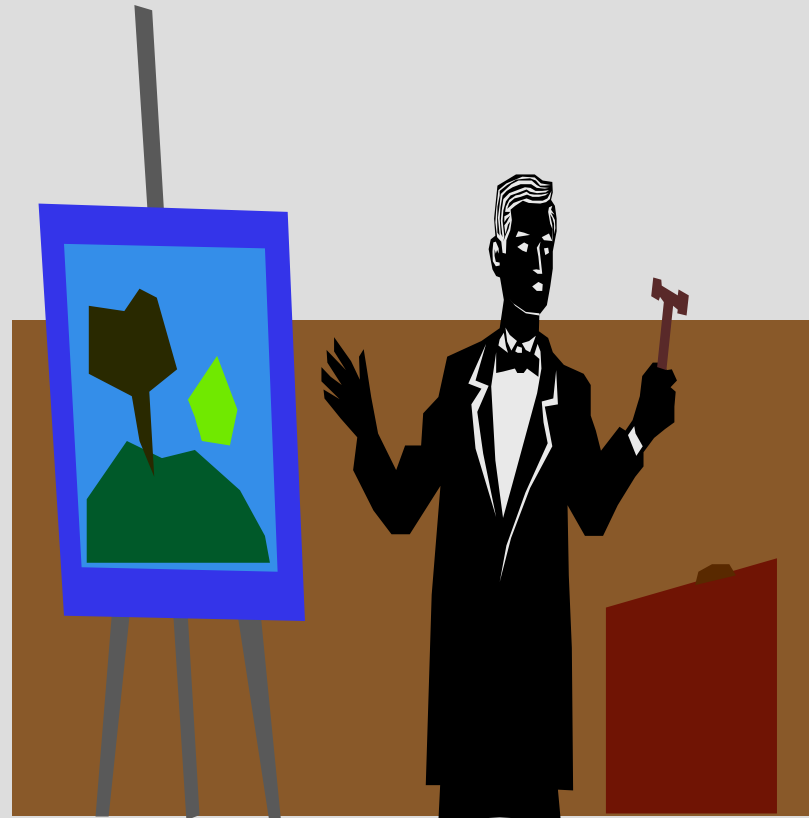
English Auction

- An ascending sequential bid auction.
- Bidders observe the bids of others and decide whether or not to increase the bid.
- The item is sold to the highest bidder.



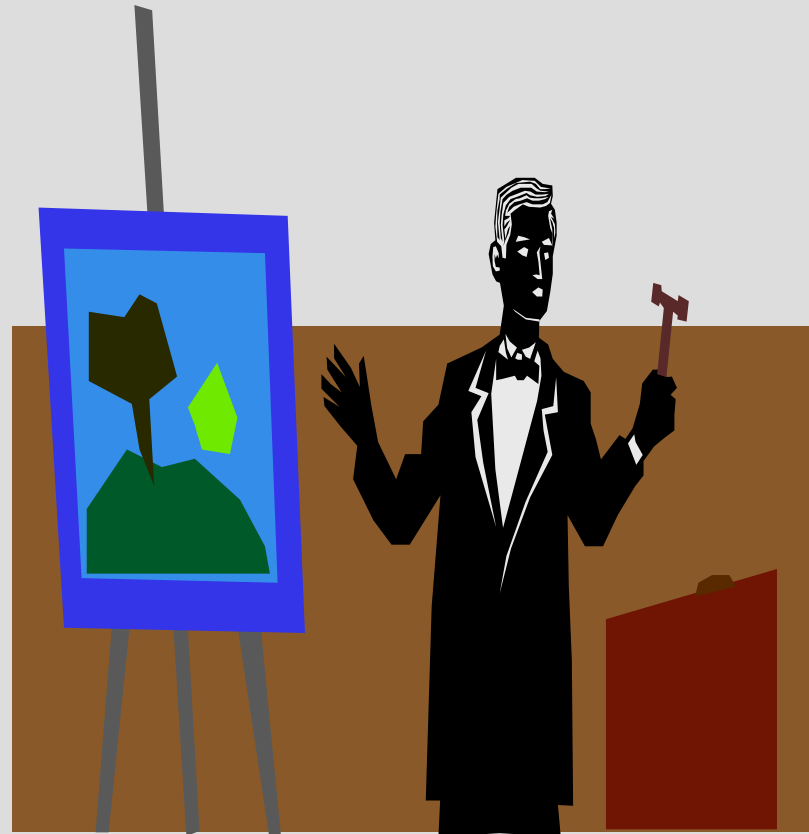
First-Price, Sealed-bid

- An auction whereby bidders simultaneously submit bids on pieces of paper.
- The item goes to the highest bidder.
- Bidders *do not* know the bids of other players.



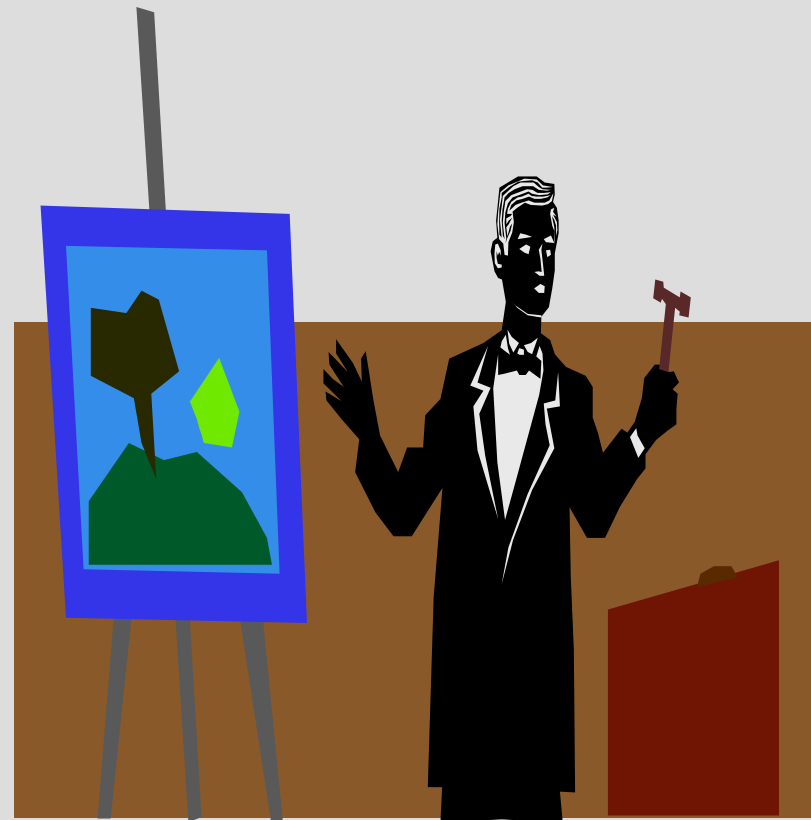
Second-Price, Sealed-bid

- The same bidding process as a first price auction.
- However, the high bidder pays the amount bid by the 2nd highest bidder.



Dutch Auction

- A descending price auction.
- The auctioneer begins with a high asking price.
- The bid decreases until one bidder is willing to pay the quoted price.
- Strategically equivalent to a first-price auction.



Information Structures

- Perfect information
 - Each bidder knows exactly the items worth.
- Independent private values
 - Bidders know their own valuation of the item, but not other bidders' valuations.
 - Bidders' valuations do not depend on those of other bidders.
- Affiliated (or correlated) value estimates
 - Bidders do not know their own valuation of the item or the valuations of others.
 - Bidders use their own information to form a value estimate.
 - Value estimates are affiliated: the higher a bidder's estimate, the more likely it is that other bidders also have high value estimates.
 - *Common values* is the special case in which the true (but unknown) value of the item is the same for all bidders.

Optimal Bidding Strategy in an English Auction

- With independent private valuations, the optimal strategy is to remain active until the price exceeds your own valuation of the object.

Optimal Bidding Strategy in a Second-Price Sealed-Bid Auction

- The optimal strategy is to bid your own valuation of the item.
- This is a dominant strategy.
 - You don't pay your own bid, so bidding less than your value only increases the chance that you don't win.
 - If you bid more than your valuation, you risk buying the item for more than it is worth to you.

Optimal Bidding Strategy in a First-Price, Sealed-Bid Auction

- If there are n bidders who all perceive valuations to be evenly (or uniformly) distributed between a lowest possible valuation of L and a highest possible valuation of H , then the optimal bid for a risk-neutral player whose own valuation is v is

$$b = v - \frac{v - L}{n}.$$

Example

- Two bidders with independent private valuations ($n = 2$).
- Lowest perceived valuation is unity ($L = 1$).
- Optimal bid for a player whose valuation is two ($v = 2$) is given by

$$b = v - \frac{v - a}{n} = 2 - \frac{2 - 1}{2} = \$1.50$$

Optimal Bidding Strategies with Affiliated Value Estimates

- Difficult to describe because
 - Bidders do not know their own valuations of the item, let alone the valuations others.
 - The auction process itself may reveal information about how much the other bidders value the object.
- Optimal bidding requires that players use any information gained during the auction to update their own value estimates.

The Winner's Curse

- In a common-values auction, the winner is the bidder who is the most optimistic about the true value of the item.
- To avoid the winner's curse, a bidder should revise downward his or her private estimate of the value to account for this fact.
- The winner's curse is most pronounced in sealed-bid auctions.

Expected Revenues in Auctions with Risk Neutral Bidders

- Independent Private Values
 - English = Second Price = First Price = Dutch.
- Affiliated Value Estimates
 - English > Second Price > First Price = Dutch.
 - Bids are more closely linked to other players information, which mitigates players' concerns about the winner's curse.

Conclusion

- Information plays an important role in how economic agents make decisions.
 - When information is costly to acquire, consumers will continue to search for price information as long as the observed price is greater than the consumer's reservation price.
 - When there is uncertainty surrounding the price a firm can charge, a firm maximizes profit at the point where the expected marginal revenue equals marginal cost.
- Many items are sold via auctions
 - English auction
 - First-price, sealed bid auction
 - Second-price, sealed bid auction
 - Dutch auction