# Economics 101A
# (Lecture 21)

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April 10, 2012

Outline

1. Oligopoly: Cournot
2. Oligopoly: Bertrand
3. Second-price Auction
4. Auctions: eBay Evidence

# 1 Oligopoly: Cournot

- Nicholson, Ch. 14, pp. 524-530 (*better* than Ch. 14, pp. 418–419, 421–422, 9th)

- Back to oligopoly maximization problem

- Assume 2 firms, cost $c_i(y_i) = cy_i$, $i = 1, 2$

- Firms choose simultaneously quantity $y_i$

- Firm $i$ maximizes:

$$\max_{y_i} p(y_i + y_{-i}) y_i - cy_i.$$

- First order condition with respect to $y_i$:

$$p'_Y \left(y_i^* + y_{-i}^*\right) y_i^* + p - c = 0, \ i = 1, 2.$$

- Nash equilibrium:
  - $y_1$ optimal given $y_2$;
  - $y_2$ optimal given $y_1$.

- Solve equations:

$$p'_Y\left(y_1^* + y_2^*\right) y_1^* + p - c = 0 \text{ and}$$

$$p'_Y\left(y_2^* + y_1^*\right) y_2^* + p - c = 0.$$

- Cournot -> Pricing above marginal cost

- Numerical example –> Problem set 5

# 2 Oligopoly: Bertrand

- Cournot oligopoly: firms choose quantities
- Bertrand oligopoly: firms first choose prices, and then produce quantity demanded by market
- Market demand function $Y(p)$
- 2 firms
- Profits:

$$\pi_i(p_i, p_{-i}) = \begin{cases} (p_i - c) Y(p_i) & \text{if } p_i < p_{-i} \\ (p_i - c) Y(p_i)/2 & \text{if } p_i = p_{-i} \\ 0 & \text{if } p_i > p_{-i} \end{cases}$$

- First show that $p_1 = c = p_2$ is Nash Equilibrium

- Does any firm have a (strict) incentive to deviate?

- Check profits for Firm 1

- Symmetric argument for Firm 2

- Second, show that this equilibrium is unique.

- For each of the next 5 cases at least on firm has a profitable deviation

- Case 1. $p_1 > p_2 > c$

- Case 2. $p_1 = p_2 > c$

- Case 3. $p_1 > c \geq p_2$

- Case 4. $c > p_1 \geq p_2$

- Case 5. $p_1 = c > p_2$

- Only Case 6 remains: $p_1 = c = p_2$, which is Nash Equilibrium

- It is unique!

- Notice:

- To show that something is an equilibrium –> Show that there is *no* profitable deviation

- To show that something is *not* an equilibrium –> Show that there is *one* profitable deviation

- Surprising result of Bertrand Competition
- Marginal cost pricing
- Two firms are enough to guarantee perfect competition!
- Realistic? Price wars between PC makers

# 3 Second-price Auction

- Nicholson, Ch. 18, pp. 659–66 [*Not* in old book]
- Sealed-bid auction
- Highest bidder wins object
- Price paid is second highest price
- Two individuals: $I = 2$
- Strategy $s_i$ is bid $b_i$
- Each individual knows value $v_i$

- Payoff for individual $i$ is

$$u_i(b_i, b_{-i}) = \begin{cases} v_i - b_{-i} & \text{if} \quad b_i > b_{-i} \\ (v_i - b_{-i})/2 & \text{if} \quad b_i = b_{-i} \\ 0 & \text{if} \quad b_i < b_{-i} \end{cases}$$

- Show: weakly dominant to set $b_i^* = v_i$

- To show:

$$u_i(v_i, b_{-i}) \geq u_i(b_i, b_{-i})$$

  for all $b_i$, for all $b_{-i}$, and for $i = 1, 2$.

1. Assume $b_{-i} > v_i$

   - $u_i(v_i, b_{-i}) = 0 = u_i(b_i, b_{-i})$ for any $b_i < b_{-i}$
   - $u_i(b_{-i}, b_{-i}) = (v_i - b_{-i})/2 < 0$
   - $u_i(b_i, b_{-i}) = (v_i - b_{-i}) < 0$ for any $b_i > b_{-i}$

2. Assume now $b_{-i} = v_i$

3. Assume now $b_{-i} < v_i$

# 4 Auctions: Evidence from eBay

- In second-price auction, optimal strategy is to bid one's own value

- Is this true?

- eBay has proxy system: If you have highest bid, you pay bid of second-highest bidder

- eBay is essentially a second-price auction

- Two deviations:

    1. People bid multiple times – they should not in this theory

    2. People may overbid

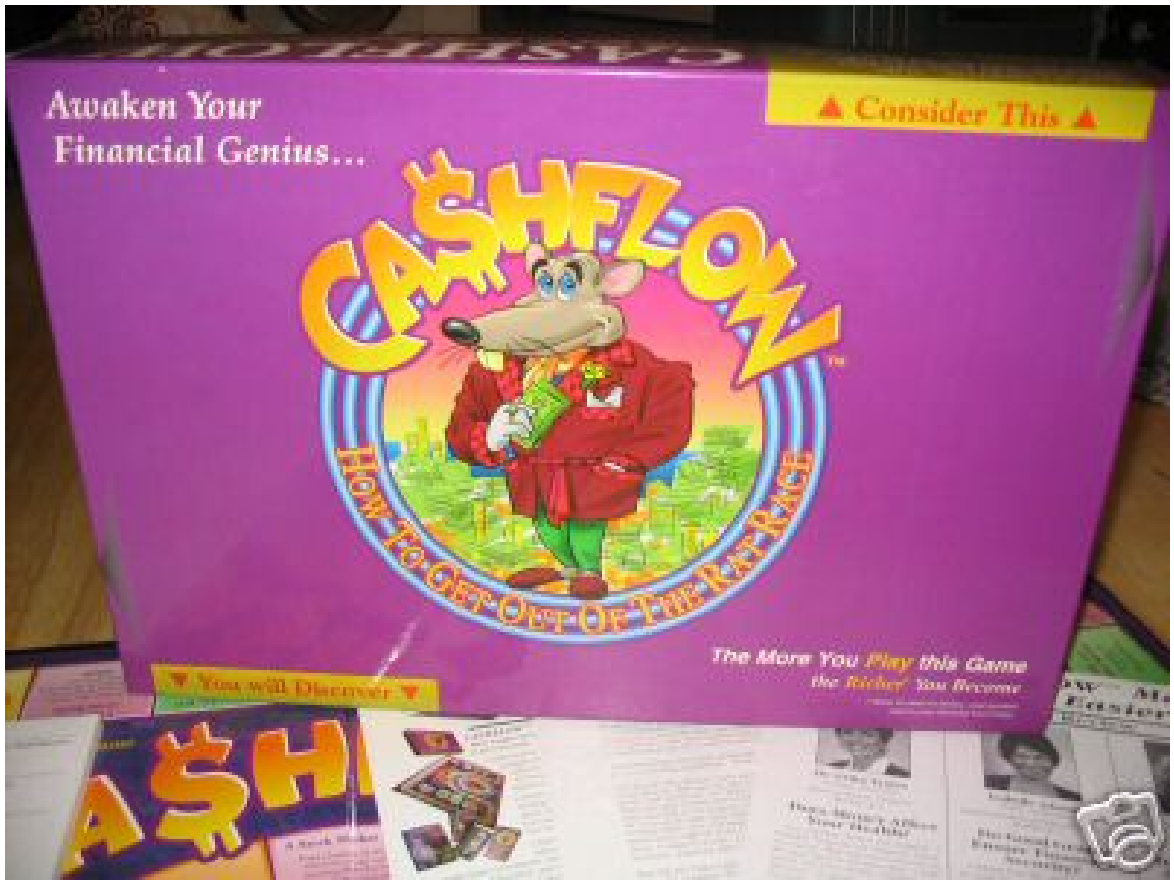
# An example: eBay Bidding for a Board Game

- Bidding environment with clear boundary for rational willingness to pay ("buy-it-now price").
- Empirical environment unaffected by common-value arguments (presumably bidding for private use; in addition "buy-it-now" price).
- Still non-negligible amount ($100-$200).

→ Is there evidence of overbidding?

→ If so, can we detect determinants of overbidding?

# The Object


Awaken Your
Financial Genius…
Consider This
CASHFLOW
How To Get Out Of The Rat Race
The More You Play this Game
the Richer You Become
You will Discover

# The Data

- Cashflow 101: board game with the purpose of finance/accounting education.
- Retail price : $195 plus shipping cost ($10.75) from manufacturer (*www.richdad.com*).
- Two ways to purchase Cashflow 101 on eBay
  - Auction (quasi-second price proxy bidding)
  - Buy-it-now
- Hand-collected data of all auctions and Buy-it-now transactions of Cashflow 101 on eBay from 2/19/2004 to 9/6/2004.

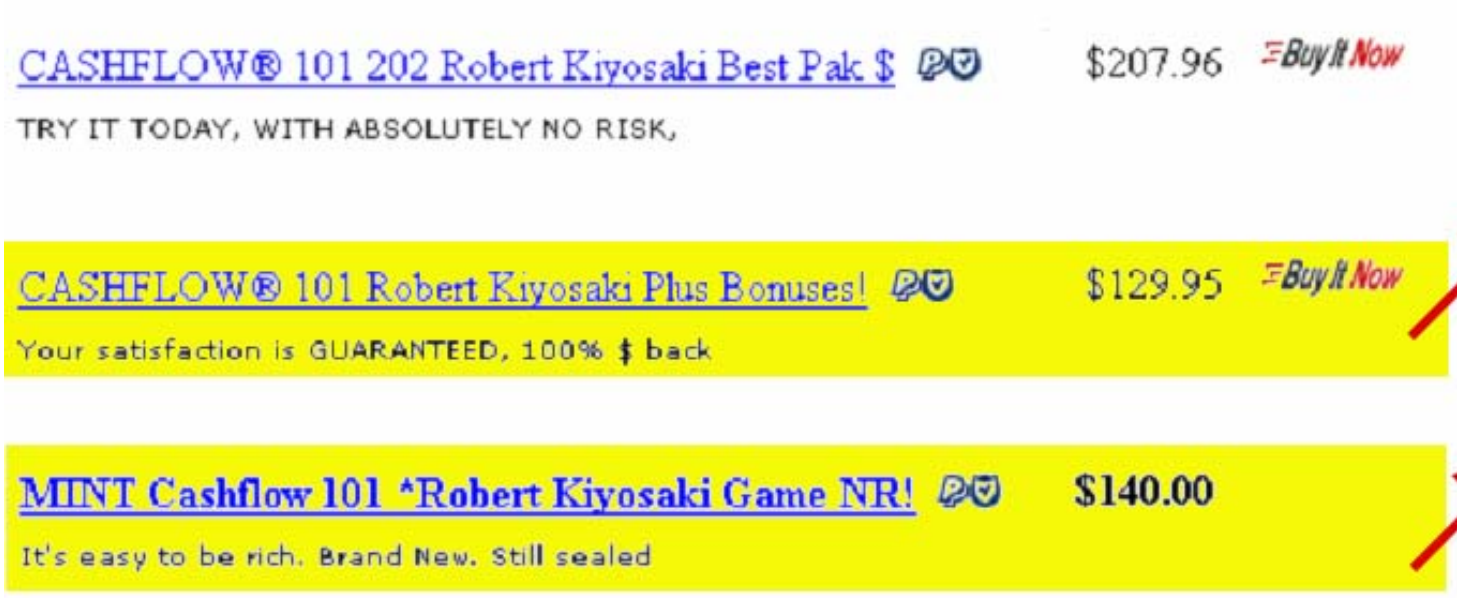
# Sample

- Listings
  - 206 by individuals (187 auctions only, 19 auctions with buy-it-now option)
  - 493 by two retailers (only buy-it-now)
- Remove non-US$, terminated, unsold items and items without simultaneous *professional* buy-it-now listing. → 169 auctions
- Buy-it-now offers of the two retailers
  - Continuously present for all but six days. (Often individual buy-it-now offers present as well; they are often lower.)
  - 100% and 99.9% positive feedback scores.
  - Same prices $129.95 until 07/31/2004; $139.95 since 08/01/2004.
  - Shipping cost $9.95; other retailer $10.95.
  - New items (with bonus tapes/video).

# Listing Example (02/12/2004)

| | | | |
|---|---|---|---|
| Rich Dad's Cashflow Quadrant, Rich dad ... | **$12.50** | 4 | 1d 00h 14m |
| Rich Dad's Cashflow Quadrant by Robert T. ... | **$9.00** | 9 | 1d 00h 43m |
| Real Estate Investment Cashflow Software $$$! | **$10.49** | 2 | 1d 04h 36m |
| CASHFLOW® 101 202 Robert Kiyosaki Best Pak $ | $207.96 | Buy It Now | 1d 06h 47m |
| TRY IT TODAY, WITH ABSOLUTELY NO RISK, | | | |
| CASHFLOW® 101 Robert Kiyosaki Plus Bonuses! | $129.95 | Buy It Now | 1d 08h 02m |
| Your satisfaction is GUARANTEED, 100% $ back | | | |
| **MINT Cashflow 101 *Robert Kiyosaki Game NR!** | **$140.00** | 13 | 1d 08h 04m |
| It's easy to be rich. Brand New. Still sealed | | | |
| cashflow Hard Money Funding 101 real estate | $14.99 | Buy It Now | 1d 09h 28m |
| BRANDNEW RICHDAD CASHFLOW FOR KIDS E-GAME | **$20.00** | 1 | 1d 13h 54m |
| CASHFLOW® 101 Robert Kiyosaki Plus Bonuses! | $129.95 | Buy It Now | 1d 14h 17m |
| Your satisfaction is GUARANTEED, 100% $ back | | | |
| CASHFLOW® 101 202 Robert Kiyosaki Best Pak $ | $207.96 | Buy It Now | 1d 15h 47m |
| TRY IT TODAY, WITH ABSOLUTELY NO RISK, | | | |

# Listing Example – Magnified




**Pricing:**

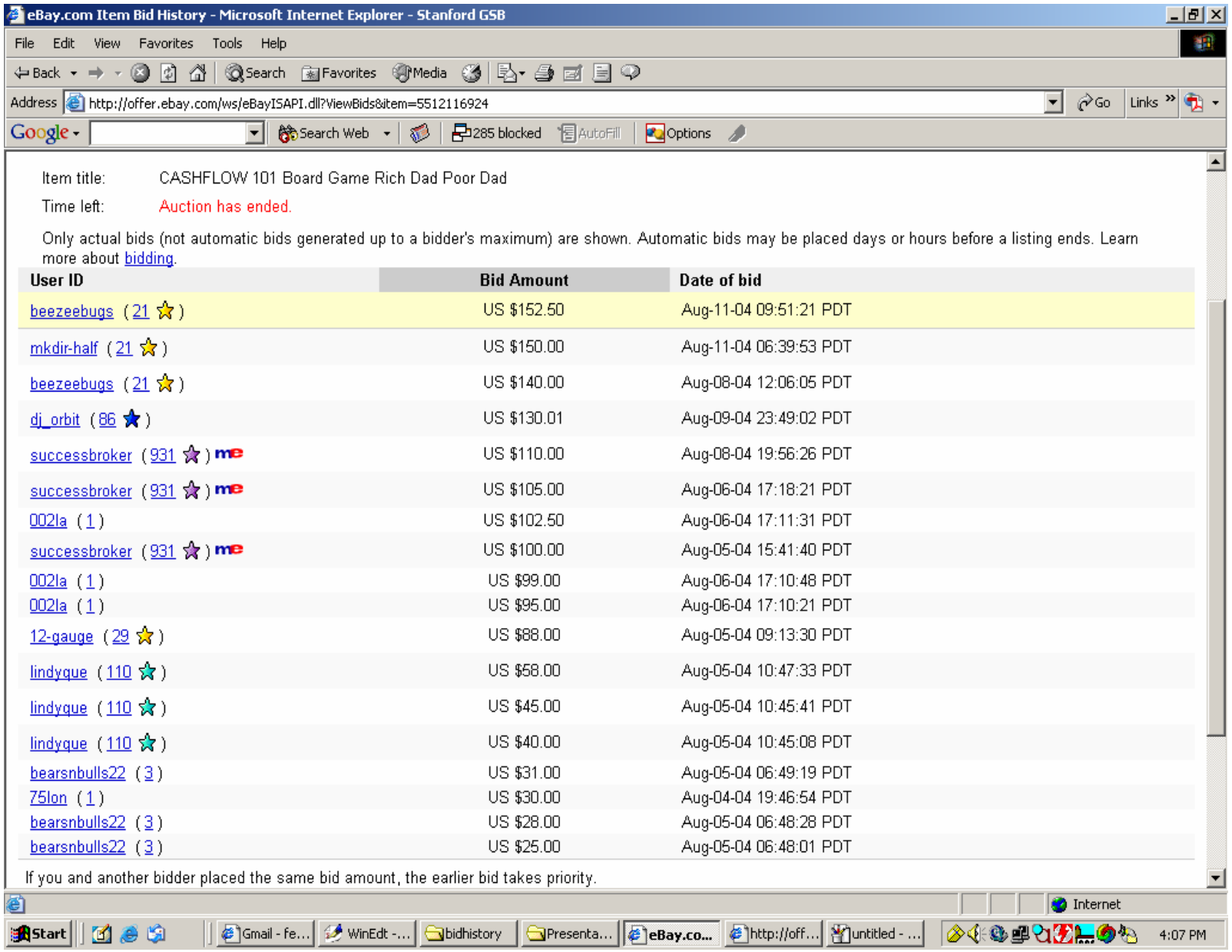
**[Buy Now]**

**$129.95**

**Pricing:**

**$140.00**

# Bidding history of an item



# Hypotheses

Given the information on the listing website:

- (H1) An auction should never end at a price above the concurrently available purchase price.
- (H2) Mentioning of higher outside prices should not affect bidding behavior.

Figure 1. Starting Price (*startprice*)

➔ 45% below $20; mean=$46; SD=43.88

➔ only 6 auctions with first bid (not price) above buy-it-now

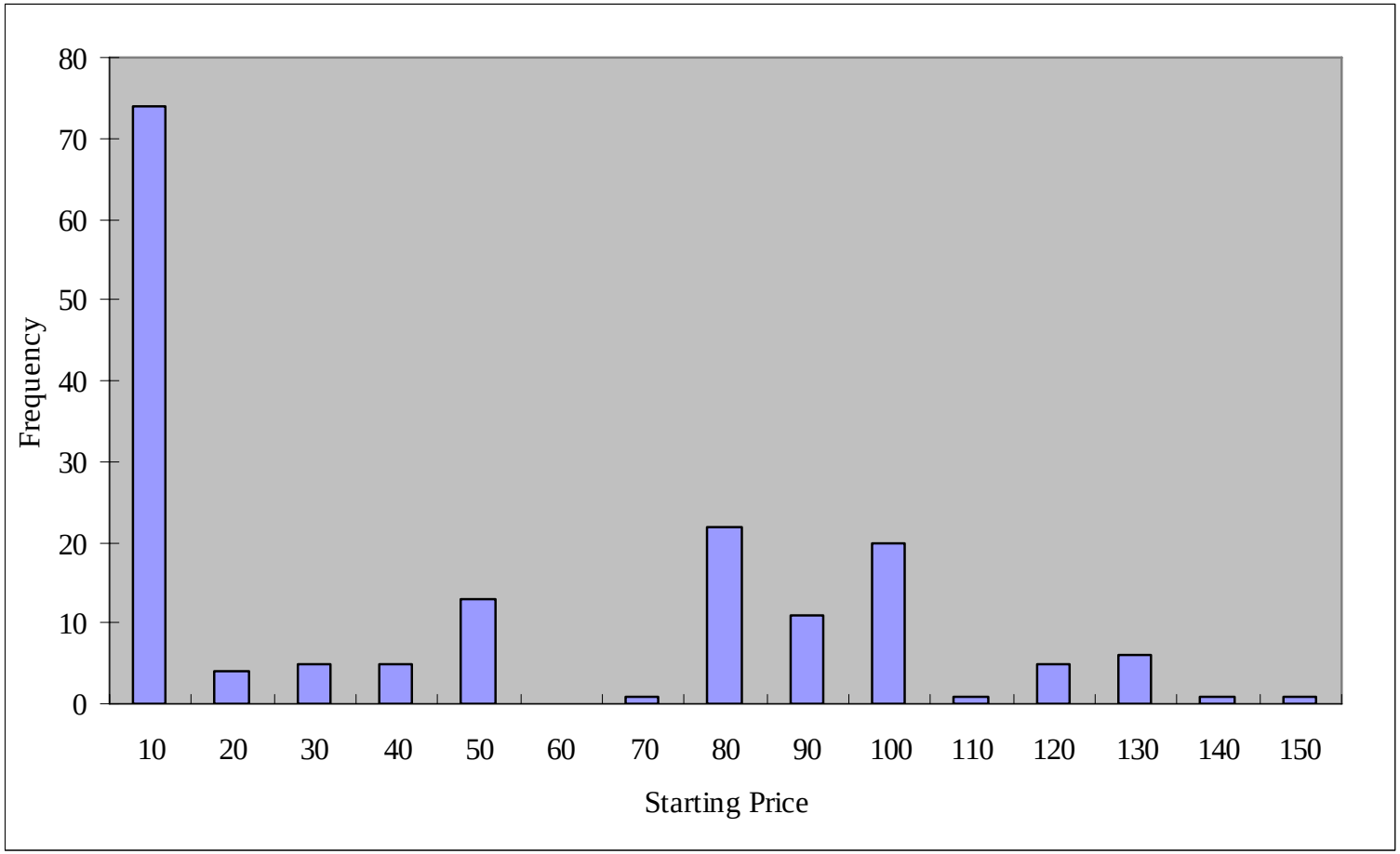


Figure 2. Final Price (*finalprice*)

➔ 41% are above "buy-it-now" (mean $132; SD 16.83)

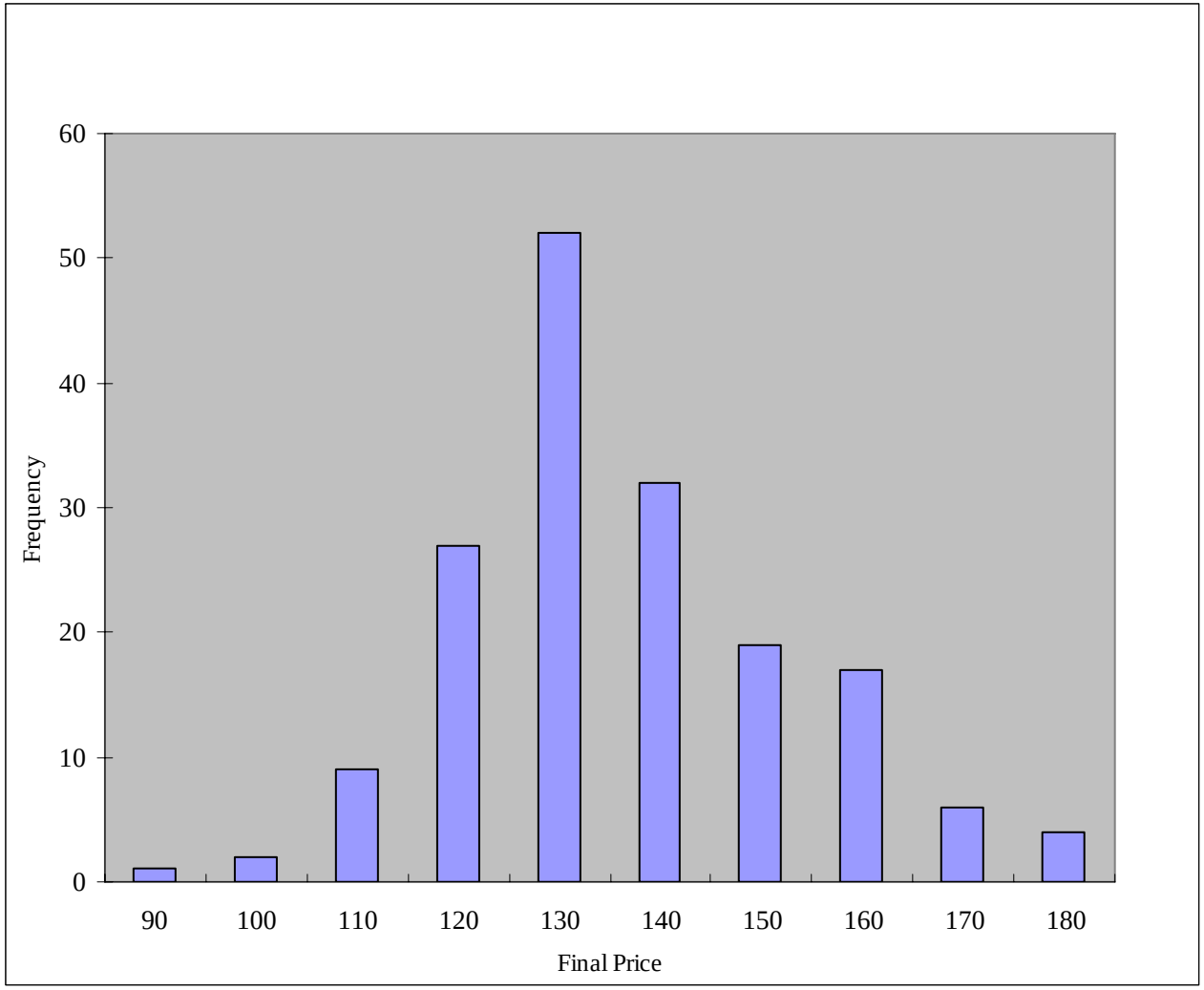
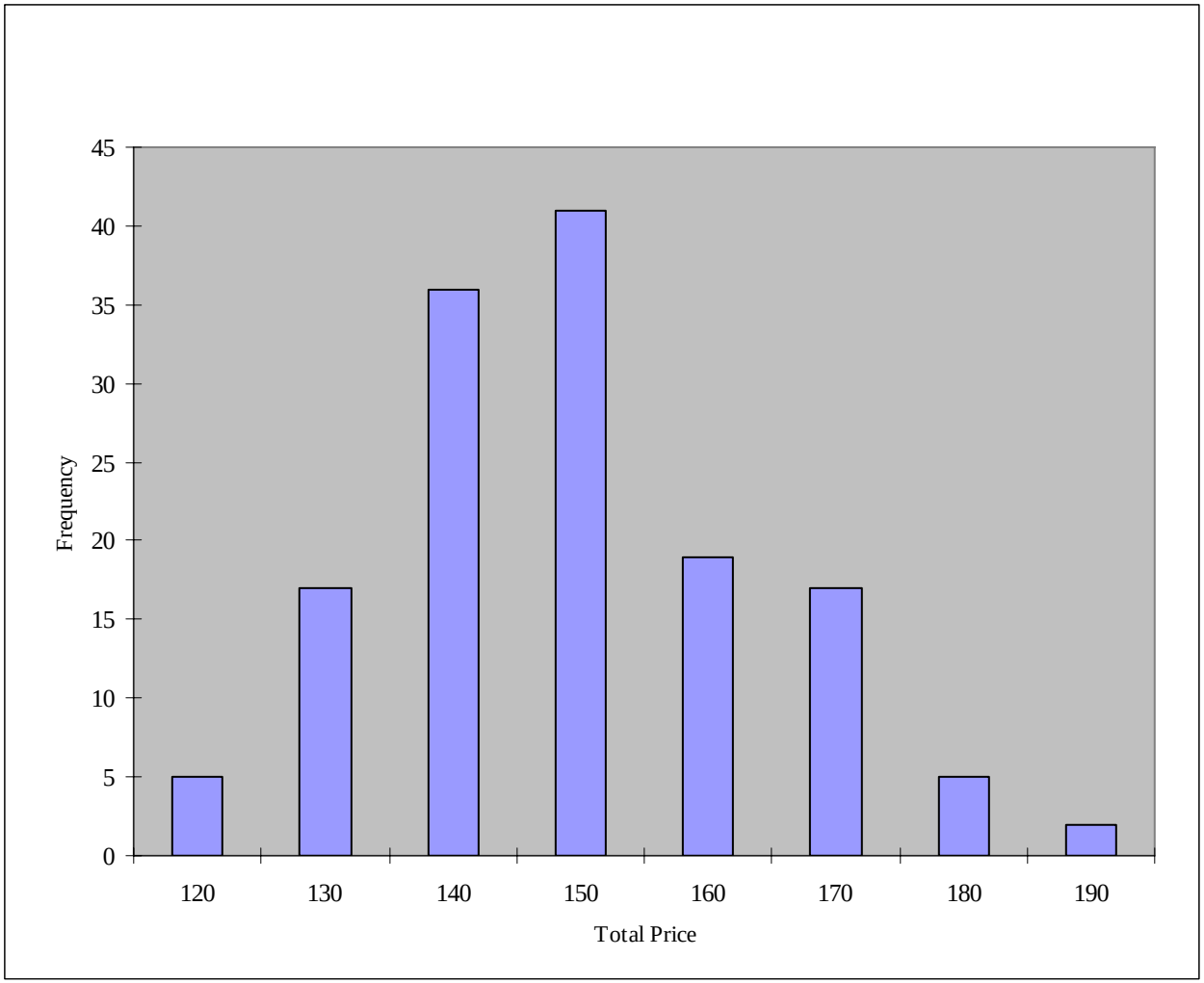


Figure 4. Total Price (incl. shipping cost)

➔ 51% are above “buy-it-now” plus its shipping cost (mean=$144.20; SD=15.00)



# 5 Next lecture

- Dynamic Games

- Stackelberg duopoly