

# Economics 101A

## (Lecture 22)

Stefano DellaVigna

April 16, 2009

## 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  $y_i$ :

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

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

- Solve equations:

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

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

- Cournot -> Pricing above marginal cost

## 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 one 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  $\rightarrow$  Show that there is *\*no\** profitable deviation
- To show that something is *\*not\** an equilibrium  $\rightarrow$  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

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

- 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

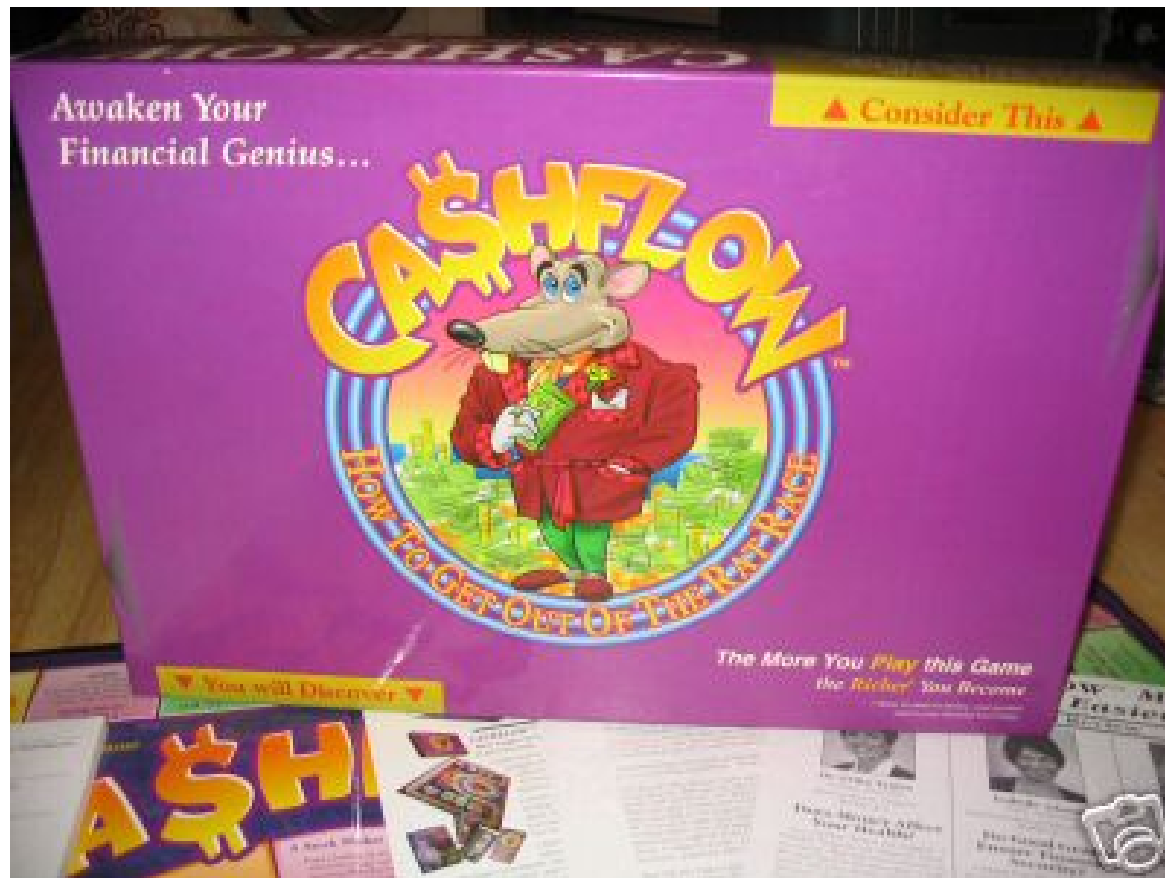
- In second-price auction, optimal strategy is to bid one's own value
- Is this true?
- eBay has proxy system: If you have highest bid, you pay bid of second-highest bidder
- eBay is essentially a second-price auction
- Two deviations:
  1. People bid multiple times – they should not in this theory
  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



# 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](http://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)

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

# Listing Example – Magnified

[CASHFLOW® 101 202 Robert Kiyosaki Best Pak \\$](#)  

\$207.96 *Buy It Now*

TRY IT TODAY, WITH ABSOLUTELY NO RISK,

**Pricing:**

**[Buy Now]**

**\$129.95**

[CASHFLOW® 101 Robert Kiyosaki Plus Bonuses!](#)  

\$129.95 *Buy It Now*

Your satisfaction is GUARANTEED, 100% \$ back

**Pricing:**

**\$140.00**

[MINT Cashflow 101 ^Robert Kiyosaki Game NR!](#)  

\$140.00

It's easy to be rich. Brand New. Still sealed

# Bidding history of an item

Item title: CASHFLOW 101 Board Game Rich Dad Poor Dad  
Time left: Auction has ended.

Only actual bids (not automatic bids generated up to a bidder's maximum) are shown. Automatic bids may be placed days or hours before a listing ends. Learn more about [bidding](#).

User ID	Bid Amount	Date of bid
<a href="#">beezebugs</a> (21 ★)	US \$152.50	Aug-11-04 09:51:21 PDT
<a href="#">mkdir-half</a> (21 ★)	US \$150.00	Aug-11-04 06:39:53 PDT
<a href="#">beezebugs</a> (21 ★)	US \$140.00	Aug-08-04 12:06:05 PDT
<a href="#">dj_orbit</a> (86 ★)	US \$130.01	Aug-09-04 23:49:02 PDT
<a href="#">successbroker</a> (931 ★) <b>me</b>	US \$110.00	Aug-08-04 19:56:26 PDT
<a href="#">successbroker</a> (931 ★) <b>me</b>	US \$105.00	Aug-06-04 17:18:21 PDT
<a href="#">002la</a> (1)	US \$102.50	Aug-06-04 17:11:31 PDT
<a href="#">successbroker</a> (931 ★) <b>me</b>	US \$100.00	Aug-05-04 15:41:40 PDT
<a href="#">002la</a> (1)	US \$99.00	Aug-06-04 17:10:48 PDT
<a href="#">002la</a> (1)	US \$95.00	Aug-06-04 17:10:21 PDT
<a href="#">12-gauge</a> (29 ★)	US \$88.00	Aug-05-04 09:13:30 PDT
<a href="#">lindyque</a> (110 ★)	US \$58.00	Aug-05-04 10:47:33 PDT
<a href="#">lindyque</a> (110 ★)	US \$45.00	Aug-05-04 10:45:41 PDT
<a href="#">lindyque</a> (110 ★)	US \$40.00	Aug-05-04 10:45:08 PDT
<a href="#">bearsnbulls22</a> (3)	US \$31.00	Aug-05-04 06:49:19 PDT
<a href="#">75lon</a> (1)	US \$30.00	Aug-04-04 19:46:54 PDT
<a href="#">bearsnbulls22</a> (3)	US \$28.00	Aug-05-04 06:48:28 PDT
<a href="#">bearsnbulls22</a> (3)	US \$25.00	Aug-05-04 06:48:01 PDT

If you and another bidder placed the same bid amount, the earlier bid takes priority.

Taskbar: Start, Gmail - fe..., WinEdt - ..., bidhistory, Presenta..., eBay.co..., http://off..., untitled - ..., Internet, 4:07 PM

# 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

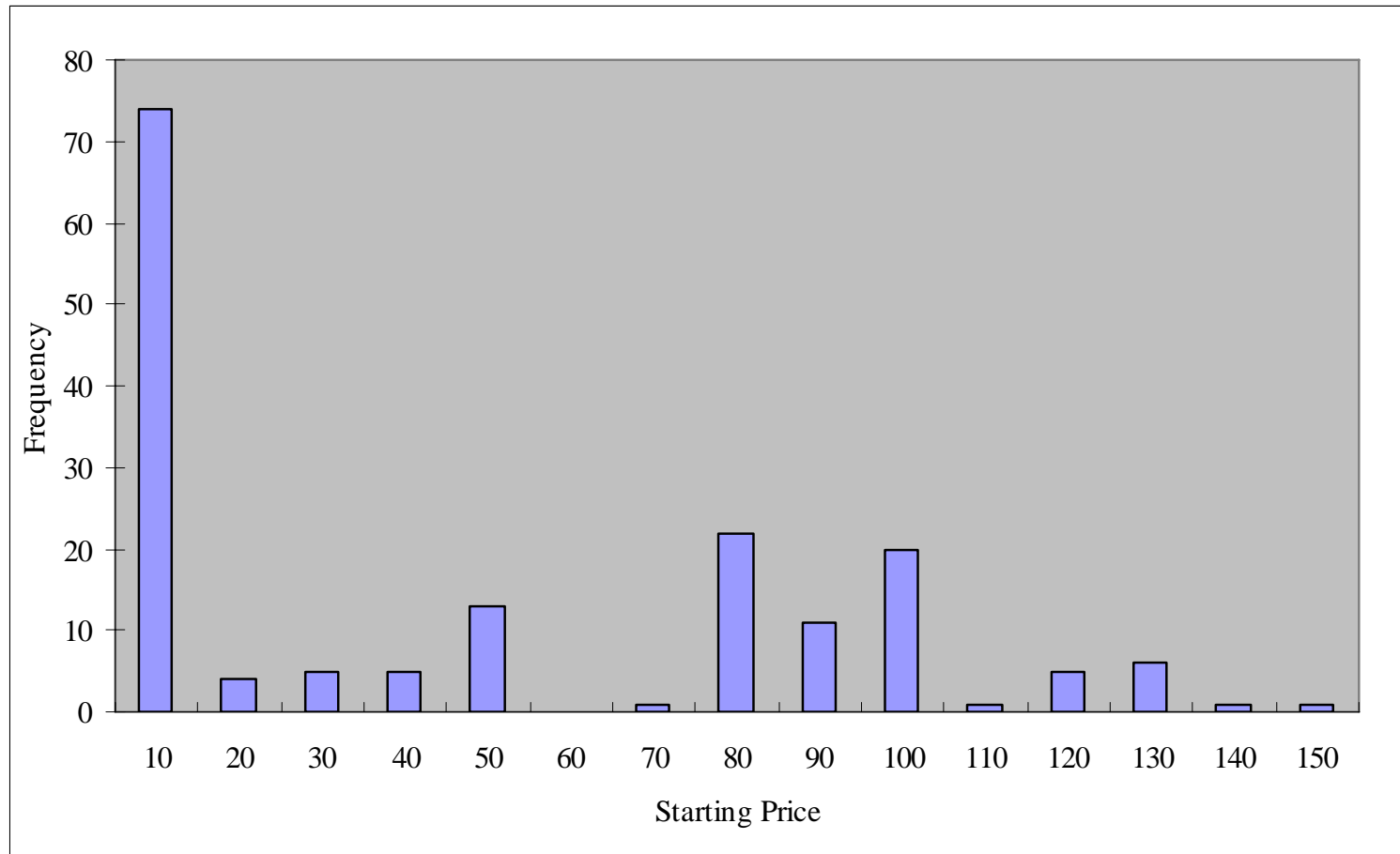




Figure 2. Final Price (*finalprice*)

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

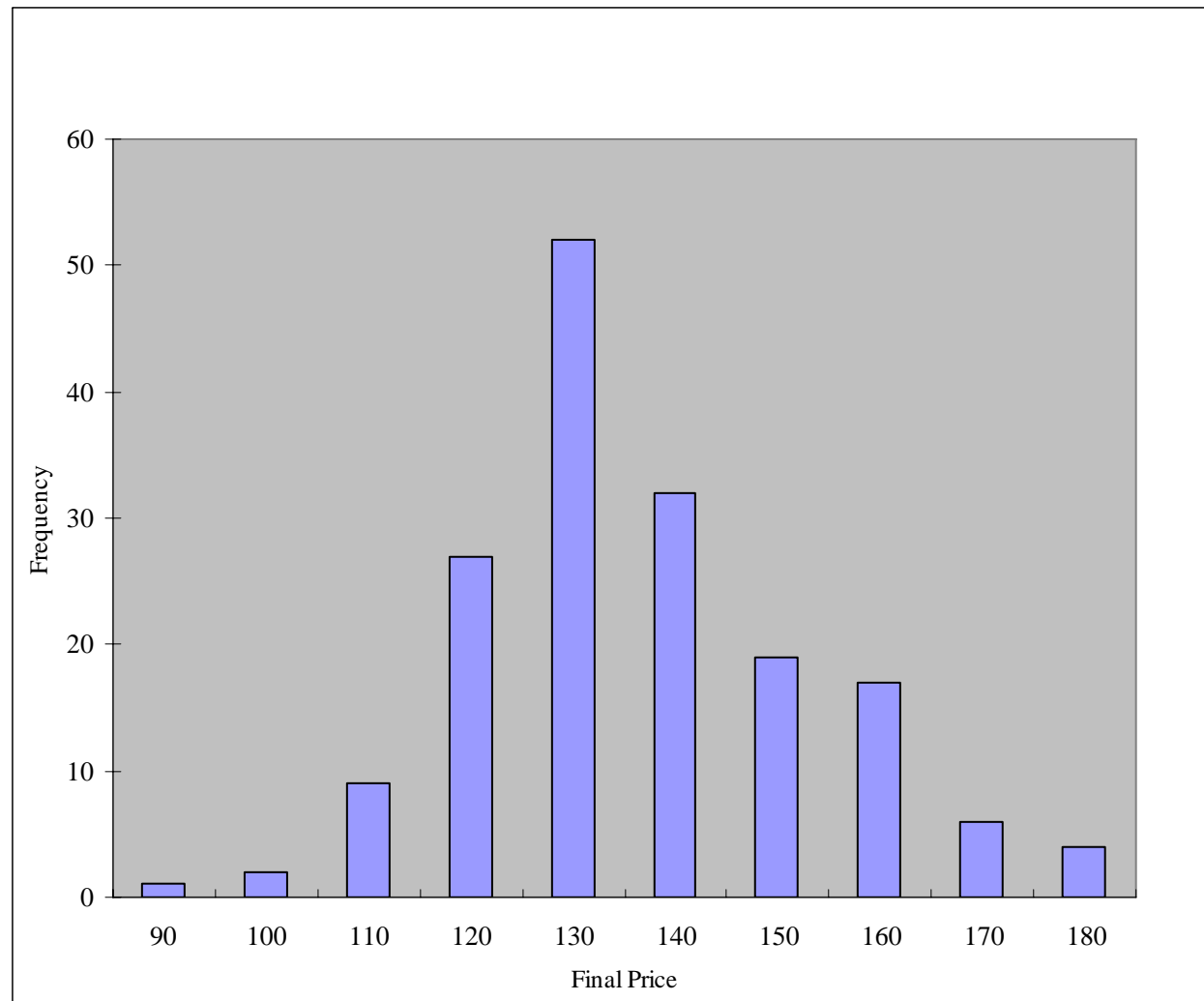
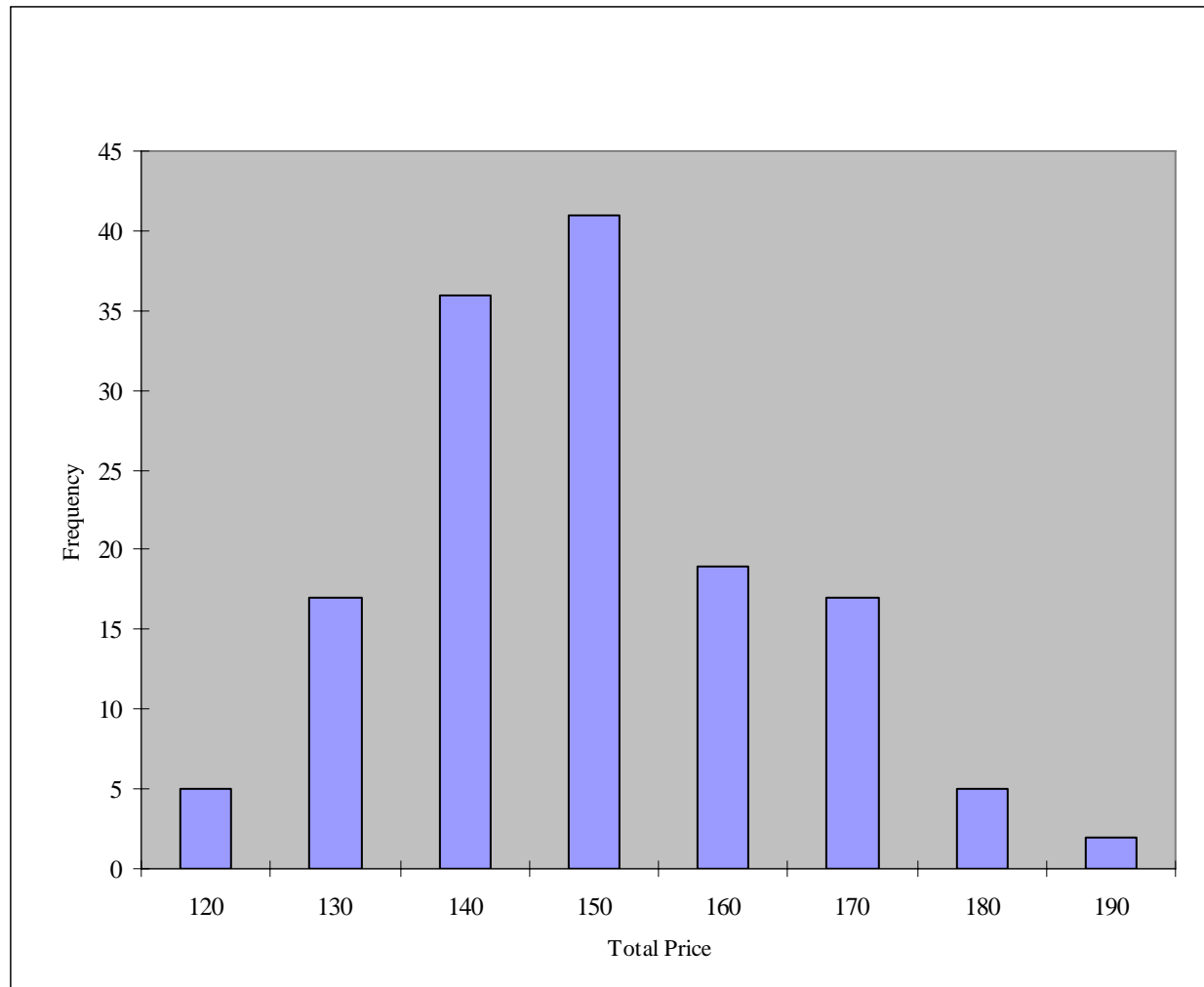


Figure 4. Total Price (incl. shipping cost)

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



# The Other Lesson?

Some unsolicited eBay advice.

- Can make money by selling “Cashflow 101” to those who aspire to become financially smart, and overpay for the board game!
- Sellers : add exaggerated retail price, pay 20 cents extra (now 40 cents) for 10 day listing!
- Buyers : check out the “buy-it-now” price before you bid!

## 5 Next lecture

- Dynamic Games
- Stackelberg duopoly