# Economics 101A
# (Lecture 23)

Stefano DellaVigna

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Outline

1. Second-price Auction
2. Auctions: eBay Evidence
3. Dynamic Games
4. Oligopoly: Stackelberg

# 1 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 $b_{-i} < v_i$

# 2 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

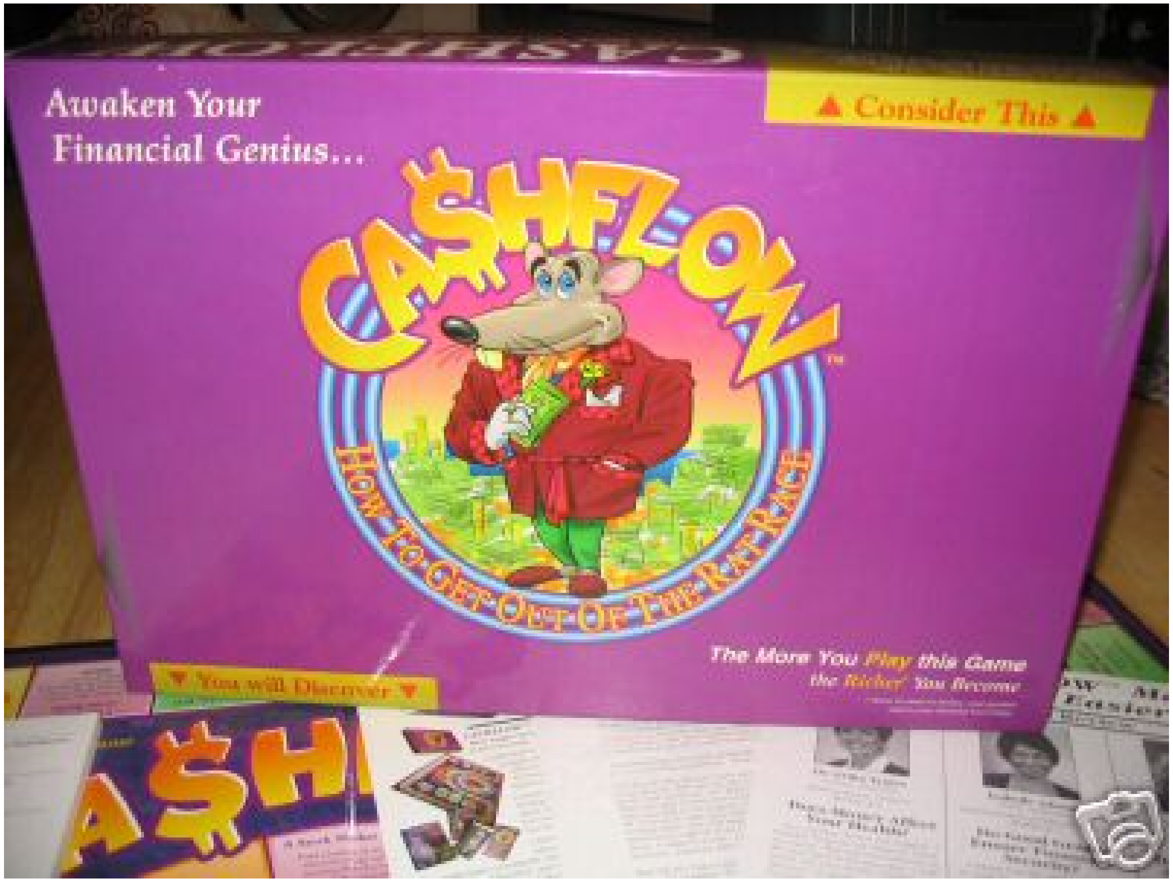
# An example:
# eBay Bidding for a Board Game

- 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.

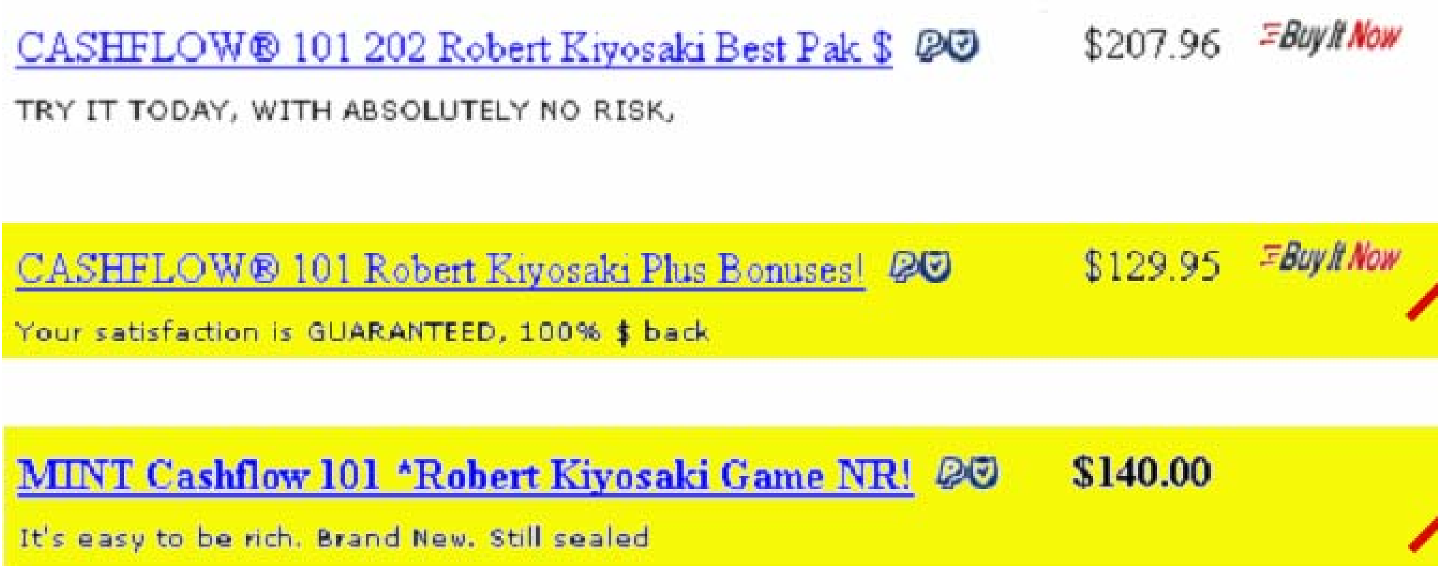
# Sample

- 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 $<br>TRY IT TODAY, WITH ABSOLUTELY NO RISK, | $207.96 | Buy It Now | 1d 06h 47m |
| CASHFLOW® 101 Robert Kiyosaki Plus Bonuses!<br>Your satisfaction is GUARANTEED, 100% $ back | $129.95 | Buy It Now | 1d 08h 02m |
| **MINT Cashflow 101 *Robert Kiyosaki Game NR!**<br>It's easy to be rich. Brand New. Still sealed | **$140.00** | 13 | 1d 08h 04m |
| 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!<br>Your satisfaction is GUARANTEED, 100% $ back | $129.95 | Buy It Now | 1d 14h 17m |
| CASHFLOW® 101 202 Robert Kiyosaki Best Pak $<br>TRY IT TODAY, WITH ABSOLUTELY NO RISK, | $207.96 | Buy It Now | 1d 15h 47m |

# Listing Example – Magnified




**Pricing:**

**[Buy Now]**

**$129.95**

**Pricing:**

**$140.00**

# Bidding history of an item

eBay.com Item Bid History - Microsoft Internet Explorer - Stanford GSB

Address: http://offer.ebay.com/ws/eBayISAPI.dll?ViewBids&item=5512116924

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 |
|---|---|---|
| beezeebugs ( 21 ) | US $152.50 | Aug-11-04 09:51:21 PDT |
| mkdir-half ( 21 ) | US $150.00 | Aug-11-04 06:39:53 PDT |
| beezeebugs ( 21 ) | US $140.00 | Aug-08-04 12:06:05 PDT |
| dj_orbit ( 86 ) | US $130.01 | Aug-09-04 23:49:02 PDT |
| successbroker ( 931 ) me | US $110.00 | Aug-08-04 19:56:26 PDT |
| successbroker ( 931 ) me | US $105.00 | Aug-06-04 17:18:21 PDT |
| 002la ( 1 ) | US $102.50 | Aug-06-04 17:11:31 PDT |
| successbroker ( 931 ) me | US $100.00 | Aug-05-04 15:41:40 PDT |
| 002la ( 1 ) | US $99.00 | Aug-06-04 17:10:48 PDT |
| 002la ( 1 ) | US $95.00 | Aug-06-04 17:10:21 PDT |
| 12-gauge ( 29 ) | US $88.00 | Aug-05-04 09:13:30 PDT |
| lindyque ( 110 ) | US $58.00 | Aug-05-04 10:47:33 PDT |
| lindyque ( 110 ) | US $45.00 | Aug-05-04 10:45:41 PDT |
| lindyque ( 110 ) | US $40.00 | Aug-05-04 10:45:08 PDT |
| bearsnbulls22 ( 3 ) | US $31.00 | Aug-05-04 06:49:19 PDT |
| 75lon ( 1 ) | US $30.00 | Aug-04-04 19:46:54 PDT |
| bearsnbulls22 ( 3 ) | US $28.00 | Aug-05-04 06:48:28 PDT |
| bearsnbulls22 ( 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.

# 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

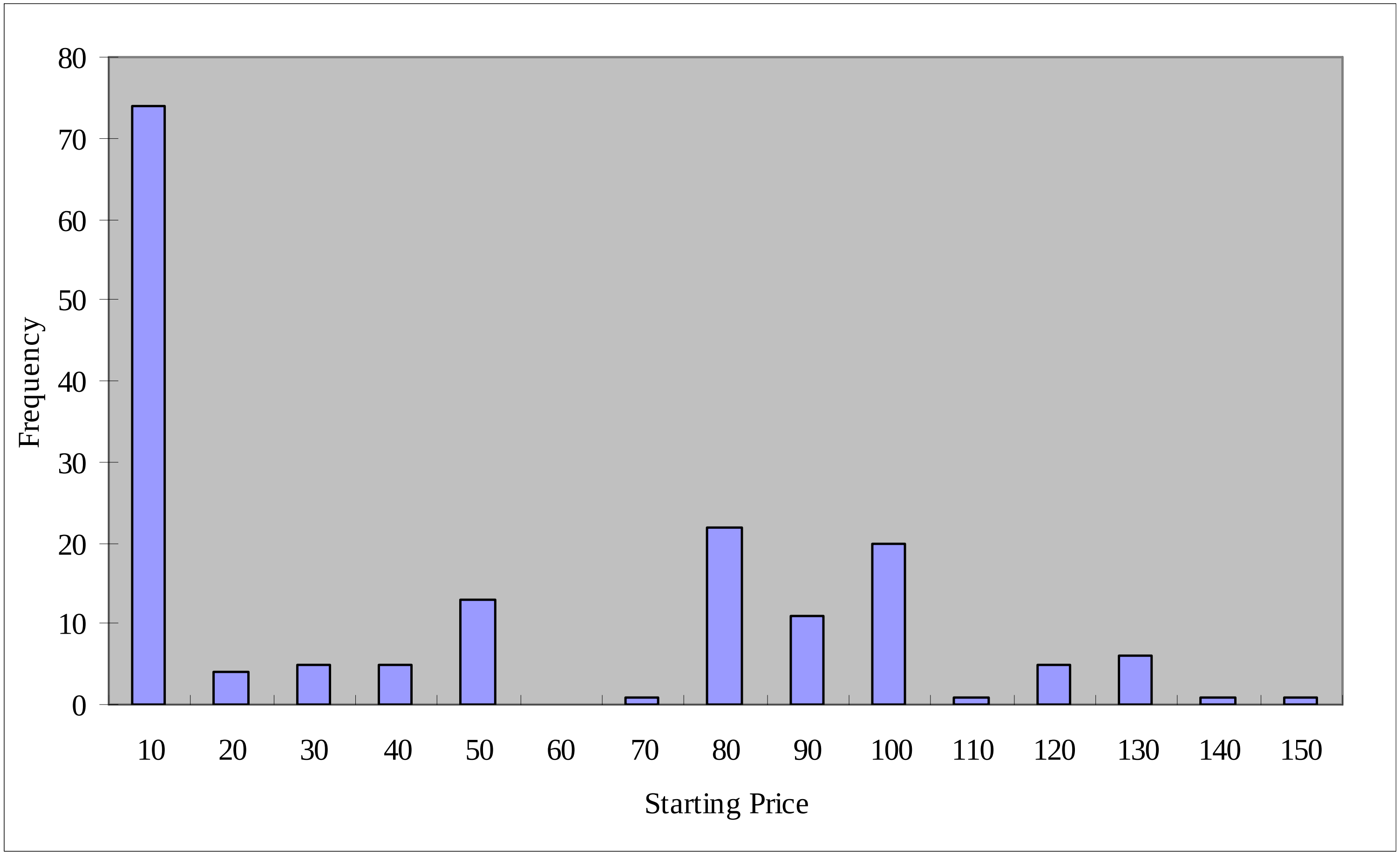


Figure 2. Final Price (*finalprice*)

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

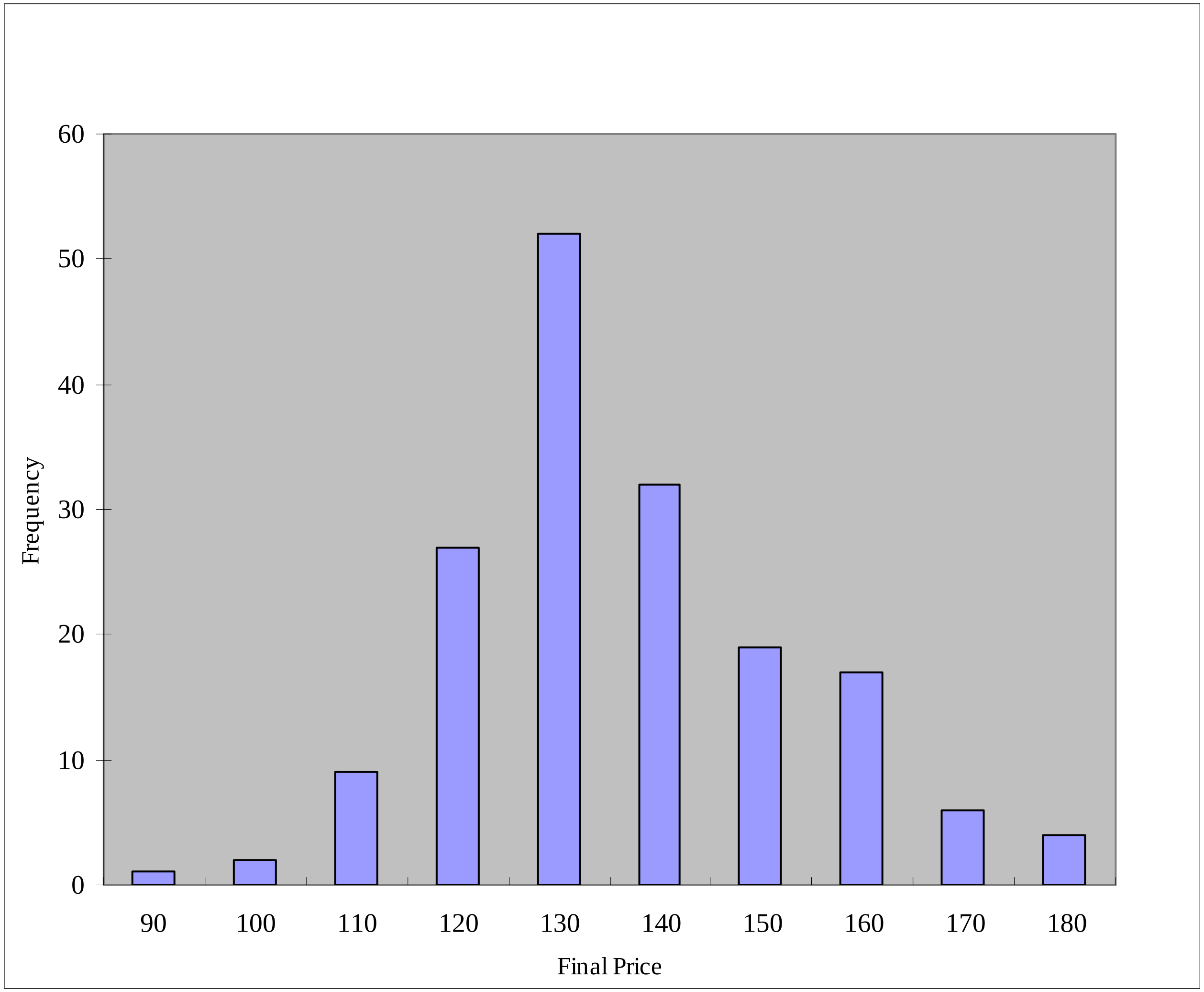
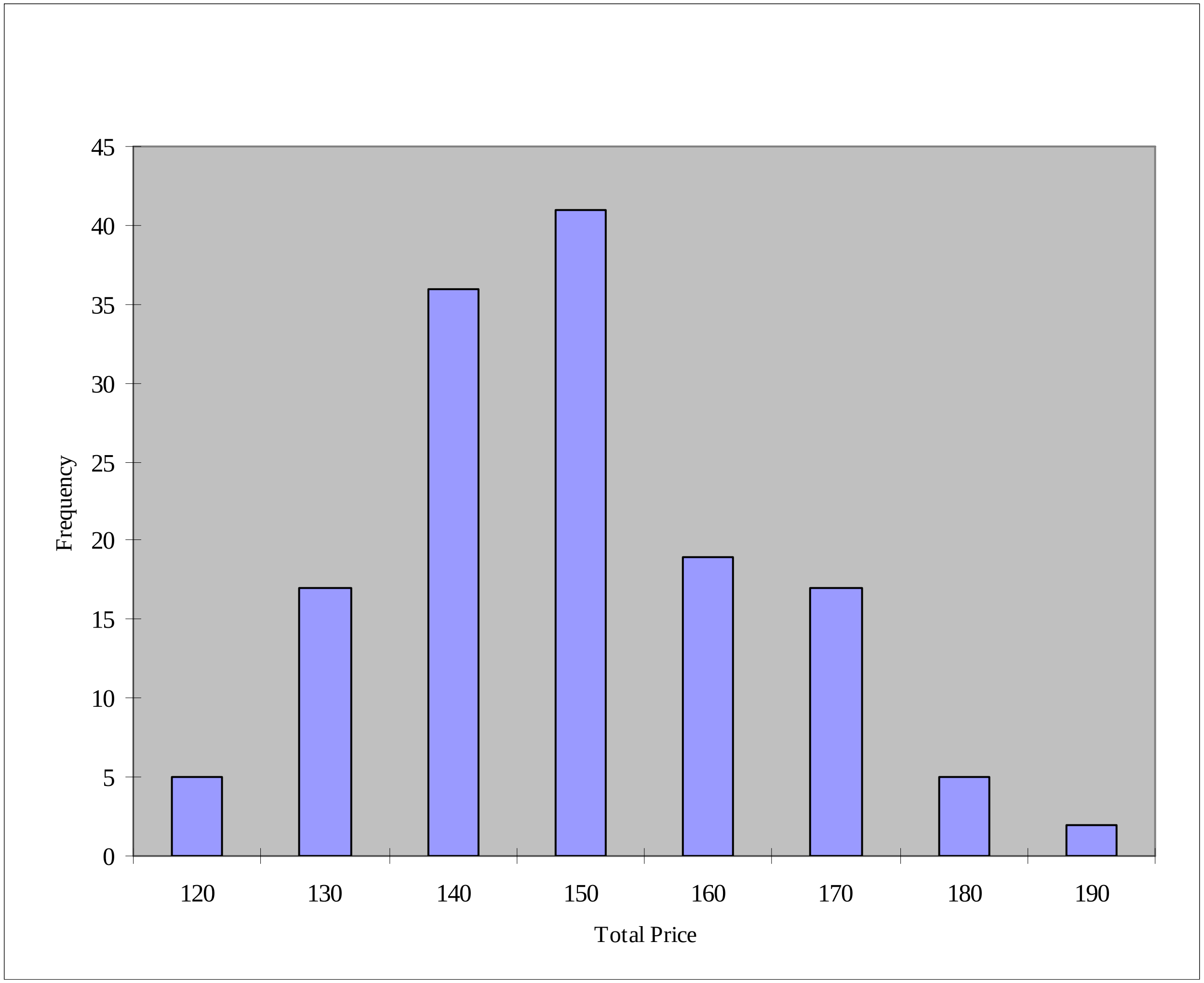


Figure 4. Total Price (incl. shipping cost)
➔ 51% are above “buy-it-now” plus its shipping cost (mean=$144.20; SD=15.00)



# 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!

# 3 Dynamic Games

- Nicholson, Ch. 8, pp. 255-266 (*better* than Ch. 15, pp. 449–454, 9th)

- Dynamic games: one player plays after the other

- Decision trees
  - Decision nodes
  - Strategy is a plan of action at each decision node

- Example: battle of the sexes game

| She \ He | Ballet | Football |
|---|---|---|
| Ballet | $2, 1$ | $0, 0$ |
| Football | $0, 0$ | $1, 2$ |

- Dynamic version: she plays first

- **Subgame-perfect equilibrium.** At each node of the tree, the player chooses the strategy with the highest payoff, given the other players' strategy

- Backward induction. Find optimal action in last period and then work backward

- Solution

- Example 2: Entry Game

| $1 \setminus 2$ | Enter | Do not Enter |
|---|---|---|
| Enter | $-1, -1$ | $10, 0$ |
| Do not Enter | $0, 5$ | $0, 0$ |

- Exercise. Dynamic version.

- Coordination games solved if one player plays first

- Can use this to study finitely repeated games

- Suppose we play the prisoner's dilemma game ten times.

| $1 \setminus 2$ | $D$ | $ND$ |
|---|---|---|
| $D$ | $-4, -4$ | $-1, -5$ |
| $ND$ | $-5, -1$ | $-2, -2$ |

- What is the subgame perfect equilibrium?

- The result differs if infinite repetition with a probability of terminating

- Can have cooperation

- Strategy of repeated game:

  - Cooperate (ND) as long as opponent always cooperate

  - Defect (D) forever after first defection

- Theory of repeated games: Econ. 104

# 4 Oligopoly: Stackelberg

- Nicholson, Ch. 15, pp. 543-545 (*better than* Ch. 14, pp. 423-424, 9th)

- Setting as in problem set

- 2 Firms

- Cost: $c(y) = cy$, with $c > 0$

- Demand: $p(Y) = a - bY$, with $a > c > 0$ and $b > 0$

- Difference: Firm 1 makes the quantity decision first

- Use subgame perfect equilibrium

- Solution:

- Solve first for Firm 2 decision as function of Firm 1 decision:

$$\max_{y_2} \left(a - by_2 - by_1^*\right) y_2 - cy_2$$

- F.o.c.:$a - 2by_2^* - by_1^* - c = 0$

- Firm 2 best response function:

$$y_2^* = \frac{a-c}{2b} - \frac{y_1^*}{2}.$$

- Firm 1 takes this response into account in the maximization:

$$\max_{y_1} \left(a - by_1 - by_2^*\left(y_1\right)\right) y_1 - cy_1$$

or

$$\max_{y_1} \left(a - by_1 - b\left(\frac{a-c}{2b} - \frac{y_1}{2}\right)\right) y_1 - cy_1$$

- F.o.c.:

$$a - 2by_1 - \frac{(a-c)}{2} + by_1 - c = 0$$

or

$$y_1^* = \frac{a-c}{2b}$$

and

$$y_2^* = \frac{a-c}{2b} - \frac{y_1^*}{2} = \frac{a-c}{2b} - \frac{a-c}{4b} = \frac{a-c}{4b}.$$

- Total production:

$$Y_D^* = y_1^* + y_2^* = 3\frac{a-c}{4b}$$

- Price equals

$$p^* = a - b\left(\frac{3}{4}\frac{a-c}{b}\right) = \frac{1}{4}a + \frac{3}{4}c$$

- Compare to monopoly:

$$y_M^* = \frac{a-c}{2b}$$

and

$$p_M^* = \frac{a+c}{2}.$$

- Compare to Cournot:

$$Y_D^* = y_1^* + y_2^* = 2\frac{a-c}{3b}$$

and

$$p_D^* = \frac{1}{3}a + \frac{2}{3}c.$$

- Compare with Cournot outcome

- Firm 2 best response function:

$$y_2^* = \frac{a-c}{2b} - \frac{y_1^*}{2}$$

- Firm 1 best response function:

$$y_1^* = \frac{a-c}{2b} - \frac{y_2^*}{2}$$

- Intersection gives Cournot

- Stackelberg: Equilibrium is point on Best Response of Firm 2 that maximizes profits of Firm 1

- Plot iso-profit curve of Firm 1:

$$\bar{\Pi}_1 = (a - c)\, y_1 - b y_1 y_2 - b y_1^2$$

- Solve for $y_2$ along iso-profit:

$$y_2 = \frac{a - c}{b} - y_1 - \frac{\bar{\Pi}_1}{b y_1}$$

- Iso-profit curve is flat for

$$\frac{dy_2}{dy_1} = -1 + \frac{\bar{\Pi}}{b\,(y_1)^2} = 0$$

or

$$y_1 =$$

Figure

# 5 Next lecture

- General Equilibrium

- Edgeworth Box