Bidding the Context of M&A

- Acquiring firms: two common modes
  - negotiation: “friendly” transaction
  - contested: “hostile” transaction
  - any acquirer needs to potentially or actually take into account more than one interested party: strategic bidding

- Strategic interaction and valuation in M&A
  - to understand acquisition strategies and wealth effects
  - auction theory: bidding behavior and price setting
  - distribution of the roles?

- Focus on sealed-bid, common-value auctions
  - winner’s curse and informational asymmetries in M&A
What is an Auction?

**auction (ôk' shôn)**

1. A public sale in which property or merchandise are sold to the highest bidder.

2. A market institution with explicit rules determining resource allocation and prices on the basis of bids from participants.

3. Games: The bidding in bridge

   [Latin: auctiō, auctiōn- from auctus, past participle of augēre, *to increase*]

Auctions in History

- Herodotus (Greek Historian): sales of future wives, Babylonia 5 B.C.
- Cassius Dio’s Roman History, Book LXXII: Sale of the Roman Empire after Pertinax 173 A.D. – Julianus winner
  - Hauswald (2003): first recorded case of “winner’s curse”
- “Modern Auctions:” Christie’s (1766) & Sotheby’s (1744)
- Agricultural commodities: fish and flowers
  - Sales of Flowers - The Netherlands (Aelsemeer): 15.000.000 lots through 50.000 transactions every day
  - fish: France, UK, Japan, Israel,…
- Concessions, procurement: inverted roles:
  - sellers, not buyers bid for supply contracts
  - FCC Spectrum Rights, Pentagon,…
Auctions Everywhere: Yesterday

SOTHEBYS  CHRISTIE'S

Going once, ... going twice, ...

Auctions Everywhere: Today

- Ebay:
  - 4 million auctions
  - 450k new/day
- >800 others
  - auctionrover.com
  - biddersedge.com
Auctions: Yesterday vs. Today

Economic Definition

- Definition (McAfee & McMillan, JEL 1987):
  - a market institution with an
  - explicit set of rules
  - determining resource allocation and prices
  - on the basis of bids from the market participants.

- Examples:
Economic Importance of Auctions

• Price discovery for object of unknown value
  – buyer and seller both unsure of true value
• Economic mechanism: fair and objective
  – “may the best [bid] win”
  – reduces complexity of negotiations
  – flexible: does not preclude other mechanisms
  – dynamic: several rounds
• Economically efficient!
  – object goes to bidder with highest value
  – incentives to perform and reveal information

Taxonomy of Auctions

• Auction protocol: submission of bids
  – open outcry: English (ascending), Dutch (descending)
  – sealed-bid auctions: first price (highest bid wins, pays own bid: M&A), second price (highest wins, pays second highest)
  – continuous double auction: matching buyers and sellers (Chicago pit-trading: each acting as own auctioneer)
• Source of values: private or common valuation
  – common values: asymmetric information or not?
• Number of objects: single or multiple units
  – Van Gogh painting vs. T-bills
• Variations of protocol: reserve prices, time limits, entry fees, royalties, increment size, shares, …
Auction Settings

- **Private** value: value of the good depends only on the bidder’s own preferences (valuation)
  - cake which is not resold or shown off
- **Common** value: bidder’s value of an item determined entirely by others’ values
  - treasury bills, oil leases
- **Correlated (affiliated)** value: bidder’s valuation depends both on own preferences and on others’
  - M&A: scope for synergies/restructuring (value creation in deal) function of acquirer’s identity (private) but company has (residual) intrinsic value (common)
  - procurement, concession: auctioning a task when bidders can handle it themselves or reauction it to others

Private Value Single Unit

- Example: dinner
  - bidder’s own valuation independent of other bidders’ valuation
Common Value Single Unit

- Example: unproven oil fields, T-bills
  - energy leases inspired modern interest in auctions
  - uncertain value, but
  - bidders have signal
- True value revealed
  - but only after bidding
  - invites what?
- M&A model?

Sealed-bid First-Price Auction

- All buyers submit their bids privately
- buyer with the highest bid wins and pays the price (s)he bid
Sealed-bid, Second-Price Auction (Vickrey: mainly for Analysis)

- All buyers submit their bids privately
- buyer with the highest bid wins, pays the price of the second highest bid

Common-Value Auctions

- Example: offshore oil leases, natural resource leases, M&A, financial investments
  - Value of item (firm, oil) is same for every participant
  - No bidder knows true value for sure; seller?
  - Each bidder has some information: e.g., exploratory drilling
- Different auction formats are not equivalent
  - Oral auctions provide information: learn what your competitors know and update your own information
  - Sealed-bid auctions: prevent collusion and preserve confidentiality, but no information released to 3rd parties
Bidding in Common-Value Auctions

• Bidder i’s estimate is $v_i = v + \varepsilon_i$
  where $v$ is the *common value* and $\varepsilon_i$ is bidder $i$’s estimation error (less than full information)

• If every bid is truthful (naïve), the winner is the bidder with the largest estimation error $\varepsilon_i$
  – so a naïve winner on average pays more than the true value $v$: *the winner’s curse*
  – implies what for bidding strategy?
  – implies what for revenue raised in sale?

Winner’s Curse: Intuition

• Common, unknown value for item (potential oil drilling site, firm acquisition): $v_i = v + \varepsilon_i$

• Most overly optimistic bidder wins; true value is probably less: largest estimation error $\varepsilon_i$ wins $\varepsilon_i^{\text{max}}$
Winner’s Curse: Illustration

- Sports: Alex Rodriguez’ $252 million contract; the runner-up bid only $152 million!
  - emotional involvement? btw, who signed ARod?
- Books: Hillary Clinton’s $8m book deal
  “I haven’t heard of the winner’s curse, but there is an old publishing dictum: ‘The only thing worse than not getting a book is getting a book.’ There’s a reason publishers tend not to like auctions.” (David Rosenthal, her publisher)
- Oil leases: ARCO worked out how to avoid WC
- Banking: entering new markets

Winner’s Curse and Bidding

- Under common-values model, estimated value is true value plus noise
  - bidder’s own analysis is an imprecise estimate of the true common value of the firm, copper mine, oil field
- Highest estimate is the one that most overestimates true value: tough luck, because
  - what does the highest estimate imply for bidding?
  - even with unbiased individual estimates, max of estimates can be significantly biased
- Bidding behavior: potential acquirers anticipate on valuation problems
  - therefore, bidder should reduce bid to adjust for this bias.
Beware Common-Value Auctions

- Learn about value from other bids: open outcry
  - whose incentive is it to release information?
  - as others drop out, revise own estimate of object’s value
- If cannot revise (sealed bid, M&A):
  - even if estimates on average correct, winner not picked randomly – highest estimate turns out to be too high
  - naïve bidder suffers WINNER’S CURSE
- The problem: sellers prefer sealed bids
  - makes it harder for bidders to collude

Bidders’ Strategic Reasoning

What would I be willing to pay given

what I know before submitting my bid

\textit{versus}

what I know before submitting my bid, and that I will only win if no one else is willing to bid higher

\textit{versus}

what I know before submitting my bid, and that I will only win if no one else is willing to bid higher and the history of bids that I have observed?
Avoiding Winner’s Curse

• Optimal strategy: bidding without regrets
  – since winning means you have the highest signal, always bid as if you have the highest signal
• Evaluate potential outcomes as basis for bid
  – if you do not have the highest signal: does not matter, because you will not win
  – if you have highest signal: what is the object worth in this case – buyer beware?

Optimal Strategy Against Winner’s Curse

Strategic Principle
The expected value of the object is irrelevant.
To bid: Consider only the value of the object if you win!
Bidding in Common-Value Auctions

- Recall: bidder $i$’s estimate $v_i = v + \varepsilon_i$
  - if every bid is truthful (naïve), the bidder with the largest estimation error $\varepsilon_i$ wins $\varepsilon_i^{\text{max}}$
  - if $\varepsilon_i^{\text{max}} > 0$ a truthful winner on average pays more than the true value $v$: the winner’s curse

- Rational bidders anticipate on winner’s curse
  - should on average bid less than $v$: bad for whom?
  - bid shading can reduce but not eliminate WC

Procurement Auctions: Role Reversal

- Procurement auction: winner’s curse consists in bidding too low on a contract to recover cost
  - seller bids, buyer accepts (the lower, the better)
  - in light of the preceding, how should you bid?
  - which bid should you accept?
From Winner’s to Buyer’s Curse

• Similar to winner’s curse, except that seller knows value of item before accepting bid, but, in addition,
  – buyer believes she can increase value of the item: no matter what I bid for firm, I avoid WC because I create new value
  – introduces private (party-specific) value element
• Expected value conditional on acceptance is lower than true value: bid shading to avoid winner’s curse
  – who likes buyer’s curse?
• Problem in M&A: winner’s curse meets
  – agency problems: weak boards (governance failures) fail to control CEO ego (get the deal done)

Example: Sale of Firm

• Buyer’s information
  – Annual reports
  – Financial statements
  – Other public documents and filings
• Knows (estimates) distribution of firm’s value
  – Uniformly distributed on \([X, X+R]\)
  – Can increase value of firm by 50%
• Seller’s information:
  – knows exact value of firm before accepting or rejecting bid
The Market for Lemons

• On October 10, 2001 George Akerloff won the Nobel Prize in Economics: his major contribution is that
  – winner’s curse can actually shut down markets.
• People can buy new cars or used cars.
  – Used cars are known to be of 2 types: Good and Bad. Half of the used cars are Good and half are Bad.
  – A Bad car is worth $2,000 and a Good car is worth $6,000.
  – It is impossible to tell the two types apart unless you actually buy and then experience the quality.
• What would you pay for a used car in this setting?
  – repeat the exercise with firms of high and low value

Lemons?

• Experiments show that buyers have a hard time anticipating the strategic behavior of sellers
  – a key is that the seller can turn down any offer to buy
  – so, you raise bid or get into a bidding war
• In the absence of gains to trade – or true liquidity shocks (with incomplete markets) -- such settings are likely to give rise to winner’s curses
• Again, exacerbated by bad governance
  – “let’s find out whether we can make the deal work”
Adverse Selection in Auctions

- Remember the procurement auction?
  - who do you think won the contract? why?
  - what is the likely consequence?

- This outcome is sometimes called “Seller’s Curse”

Asymmetric Information

- Bidder with highest valuation does not necessarily win.
  - different auction types yield different expected revenues because of information revelation

- Common-value auction, sealed bid: M&A
  - better informed bidder (insider) always bids unless value estimate such that (s)he cannot break even on low value
  - less informed bidders sometimes refrain from bidding: too afraid of winner’s curse from insider’s superior information
  - outsider can only hope to break even on average

- What would you expect to be true about revenue?
The More, The Merrier?

- More bidders lead to higher prices: great for target
- More bidders leads to less surplus: bad for acquirer
- Example (second-price auction): expected price
  - valuations are drawn uniformly from [20,40]
  - exacerbates winner’s and buyer’s curses

Asymmetric Information in M&A

- A division (firm) is on the block, investment bank conducts auction: expression of interest
- First-price sealed-bid common value auction
  - four potential bidders A, B, C, D
- Information structure: asymmetric info
  - A & B have same good info: LBO investors
  - C has this & extra signal: competitor
  - D has poor but independent info: diversifier
- Who should bid and if so, what?
Bidding with Asymmetric Info

- Deep result in auction theory: C is the most informed bidder – *caveat emptor*
  - C only lets other parties win when own analysis reveals that the target is not interesting (overpriced)
  - A & B should not bid: C would take them to the cleaners: “if I know what you know,…”
  - D should sometimes bid: but will only break even

=> “Bid less if more bidders or your info is worse”
  - Most important in sealed-bid auctions & Dutch

Lessons for M&A

- Acquirers (bidders): takeover strategy
  - assume that you have the most optimistic estimate for value and synergies: bid for assets accordingly (shading)
  - shade bids in 1st price auctions: regardless of valuation
- Target: putting oneself onto the block
  - Preclude cooperation among bidders
  - Announced reserve price to gain efficiency and relieve doubts: “we expect to raise from the upcoming disposal…”
  - In common value auctions, provide information to help with winner’s curse: M&A due diligence
  - entice other bidders to participate: bidding wars!
M&A and Winner’s Curse

• If there is an explicit “bidding war” for the target the auction analogy is obvious
  – but often no other bidders are involved
  – here the buyer may start with a very high pre-emptive bid to discourage other bidders: auction-like outcome

• In general when one company buys another company, the buyer’s stock price falls
  – in many cases, buyer admits to paying too high a price

• Current owners often agree to the merger – what should this tell you?
  – “friendly” M&A: friendly to whom?

Designing Sales

• Target’s board picks “best” sale format: always corresponds to an auction
  – release information (open): reduces winner’s curse, higher valuations vs. collusion, competitiveness
  – confidentiality (sealed-bid): winner’s curse, less revenue because of bid shading

• When to pick which format?
  – depends on circumstances: affiliated values setting
Auction and Incentives

• Sellers and bidders often continue to interact after the auction, especially in M&A
  – auctions also need to provide appropriate incentives for both parties to honor the contract: if not, what happens?
  – recall the lazy beaver!

Summary

• Key insight: buying objects of uncertain value
  – winner’s curse, exacerbated by synergy potential
  – adjusting bids for potential valuation bias only partially offsets negative consequences
  – bidding against more informed party: can expect at best to break even

• Open question: what about bidding wars, managerial agency conflicts and governance failures
  – CEO ego and hubris
  – emotional component of bidding for assets with other people’s money
Appendix: More on Auctions

- Seller: Which auction will yield the best results?
- Bidder: What should be my bidding strategy given the auction type?
- Economist:
  - Best = Optimal?
  - But avoid winner’s curse
  - How do auctions compare across types and bidders’ values for the good?
  - Truth revealing?

Bidders’ Values

- Bidder $i$ has a valuation $v_i$ for the item, known only to $i$.
  - When $v_i$ is drawn from common-knowledge distribution $F_i$, this is called the *independent-private-values* model.
- Item has “objective” value $V$, bidder $i$ has beliefs $Pr_i(v)$.
  - When bidders’ beliefs are based on an observation $v_j$ from common-knowledge distribution $H_{v_j}$, this is called the *common-values* model.
Common Value Auctions

• Dutch strategically equivalent to first-price sealed-bid
  – Vickrey not strategically equivalent to English
  – All four protocols allocate item efficiently
• Winner’s curse in common value auctions: optimal bid is
  \[ \tilde{v}_1 = \mathbb{E}[v | \hat{v}_1, b(\hat{v}_2) < b(\hat{v}_1), \ldots, b(\hat{v}_N) < b(\hat{v}_1)] \]
  – bidder should shade/shave (bid low) even in Vickrey & English
  – revelation to proxy bidders?
• Theorem (revenue non-equivalence). With more than 2 bidders, the expected revenues are not the same:
  – English \( \geq \) Vickrey \( \geq \) Dutch = first-price sealed bid

Mechanism Properties

• Efficiency
  – Agents with highest valuations get the goods.
  – If not, aftermarket is likely.
• Incentive compatibility
  – Optimal bid policy is to report honestly.
  – Avoid counter speculation: consideration of other agents’ strategies.
  – Easy to determine efficient allocation
• Distribution of surplus
• Transaction costs
• Manipulation by coalitions
Collusion and Manipulation

• Notice that, if some bidders collude, they might do better by bid-shading (lying),
  – e.g., by forming a ring
  – auctions very efficient at extracting information since in many settings, bidding true valuation is best strategies

• All auction formats are subject to some sort of manipulation by collusion among buyers, sellers, and/or auctioneer
  – might manipulation be a problem in M&A?
  – where would it show up

Prediction Auctions
Iowa Electronic Markets

http://www.biz.uiowa.edu/iem
### Prediction Auction Games

#### Hollywood Stock Exchange

[Image of Hollywood Stock Exchange interface]

**Best Actors**

<table>
<thead>
<tr>
<th>Name</th>
<th>Symbol</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kevin Spacey - American Beauty</td>
<td>OAKSF</td>
<td>15.76</td>
</tr>
<tr>
<td>Russell Crowe - The Insider</td>
<td>OARCW</td>
<td>0.71</td>
</tr>
<tr>
<td>Denzel Washington - The Hurricane</td>
<td>OARCWA</td>
<td>11.76</td>
</tr>
<tr>
<td>Richard Farnsworth - The Straight Story</td>
<td>OARFSA</td>
<td>0.32</td>
</tr>
<tr>
<td>Sean Penn - Sweet and Lowdown</td>
<td>OASPEN</td>
<td>0.45</td>
</tr>
</tbody>
</table>

#### Foresight Exchange

[Image of Foresight Exchange interface]

- $1 iff Cancer cured by 2010
- Machine Go champion by 2020
- Canada breaks up by 2020

[Images of charts]

[Links]

- [HSX](http://www.hsx.com/)
- [Ideosphere](http://www.ideosphere.com/)
- [Newsfutures](http://www.us.newsfutures.com/)
- [100world](http://www.100world.com/)
Prediction Markets

The Winner’s Curse

• A painting contractor’s testimony:
  “I do most of my work for a few builders that I have known for years. My estimates of what it will cost to do a job for one of them come out about right. Sometimes a little high, sometimes a little low, but about right overall. Occasionally, when business is slow, I bid on a big job for another builder, but those jobs are different: They always run more than I expect.” (Paul Milgrom’s father)