Auction

Auction Theory

- **Object**: has a true value $V$
- **Bidders**: $N$ of them; they don't know $V$, but do know the distribution $F(V)$
- **Bid**: $b_i = i^{th}$ bidder's bid

**First-Price, Sealed Bid**: bidders submit bids without seeing other bids (e.g., mail them in sealed envelopes that aren't opened until all bids are received); this is equivalent to bidding simultaneously; highest bid wins and pays his bid

**Other Mechanisms** -
- **Second-Price, Sealed Bid**: highest bid wins and pays second highest bid (like E-bay on the second-price part, but E-bay isn't really sealed bid)
- **Ascending Auction**: bidders see other bids and offer higher bid if they want; last bidder to bid wins
- **Descending Bids**: lowest bid wins (e.g., construction contracts)
- **Sequential Bidding**: reveals information

**Expected Payoff**: $E[(V - b_i) | b_i > b_j, \forall j \neq i]$ (i.e., value minus bid given that bid wins)

**Strategy**: $v_i = i^{th}$ bidder's estimate of $V$; his strategy is to bid $b_i = \sigma(v_i)$

**Assume**: $\sigma(v_i)$ is monotonic increasing

**Equilibrium Bidding**: lots of equations; it's a game theory model, but is well defined and always has equilibrium (usually unique because of continuous strategy; don't have to worry about mixed strategies)

**Hendricks & Porter.** "An Empirical Study of an Auction with Asymmetric Information."

(1988)

"If you get a unique data set you'll be set for the rest of your life."
"They always say, 'Yeah, yeah, I'll send you the data,' but they never did."

**Basics**: applies data from federal offshore oil and gas drainage lease auctions to test predictions of asymmetric information auction theory

**Symmetric Information**: Wilson (1967, 1977) developed basic auction theory

**Asymmetric Information**: Weverbergh (1979) and Engelbrecht-Wiggans, Milgrom & Weber (1983); theoretical work on this area

**Polar Case**: "auction in which one agent has (exact) private information about the value of the object, and others have access only to (noisy) public information"

**Drainage Sale**: "consists of the simultaneous action of tracts which are adjacent to tracts on which deposits have been discovered"

**Wildcat Sale**: "consists of tracts in areas that have not been drilled, and on which firms are permitted to acquire only seismic information"

**20/20 Hindsight**: H&P using data from 1959-1969 so they know the ex post returns from these sales
Table 1 - shows interesting results; draining tracts are more likely to be productive, when productive have higher average profits, but there are a lower number of bidders... seems contradictory to have more bidders (on wildcat tracts), but get a lower winning bid; "Even though drainage tracts were lower risk investments and yielded a significantly higher rate of return, firms were less likely to participate in these auctions."

Neighbors - firms on border of drainage tract have private information (i.e., asymmetric information auction); "Firms which own neighbor tracts obtain information about the drainage tract from their drilling activities on adjacent tracts."

Wildcat - "Information in a wildcat auction is essentially symmetric, since the precision of seismic survey information is not likely to vary much across firms"

Why Fewer Bids - other firms are scared about neighboring firm's private info

Winner’s Curse - Non-neighbor "bids will win only if the neighbors' estimate is low"; "neighbor firms won most of the profitable drainage tracts, and their average share of the value of drainage tracts is about 44 percent. By contrast, non-neighbor firms earned approximately zero profits."

Keep Honest - non-neighbors still have to bid to keep neighboring firms honest; they don't want to win because winning suggests they outbid the neighboring firm so it probably won't be profitable; "at least one non-neighbor firm bid in 69 percent of the auctions"

Private Info - "number of non-neighbor bids was more than twice that of neighbor bids, but neighbor firms won well over one-half of the drainage tracts on which they bid. Average net profits to non-neighbor firms were significantly negative on the set of tracts where no neighbor firm bid, and positive on the set of tracts where a neighbor firm bid."

Multiple Neighbors - "two-thirds of the sample of drainage tracts had multiple neighbor firms. In these cases, competitive bidding among neighbor firms should have eliminated most, if not all, of the information rents. The fact that these rents were positive, and large, suggests that neighbor firms may no have competed against each other."... possible consortium:

Legal - "no law prohibiting firms from forming a bidding consortium in federal offshore auctions"; Ai: "Collude is illegal; coordinate is not."

Bidding - 74 tracts with multiple neighbors, but only 17 had multiple neighbor bids

Profits - "net profits were not significantly lower on tracts with multiple neighbors than on tracts with one neighbor firm"

Decreasing Bids - "bids of the neighbor firms are strictly decreasing in the number of neighbor firms"

Main Empirical Predictions
1) Event that no neighbor firm bids occurs less frequently than event that no non-neighbor firm bids
2) Neighbor firm wins at least one-half of the tracts
3) Expected profits to non-neighbor firms are zero; negative on set of tracts where no neighbor firm bids and positive on those where neighbor firm bids
4) Above average profits for neighbor firm (incorporates information premium)
5) ?
6) Bidding strategy of the neighbor firm is independent of the number of non-neighbor firms
7) Bidding strategy of neighbor firm is an increasing function of the public signal

**Estimation Methods** - Tobin model... not important

**Result** - "the data are consistent with the predictions of the Bayesian Nash equilibrium model of bidding in first-price, sealed bid auction with asymmetric information"