Engineering Allowance Auctions:
Some lessons from U.S. experience

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Outline

- American experiences with emission auctions
- Why auction allowances?
- The auction design process
- How should we judge auction outcomes?
- The two essentials:
  - Competitiveness and incentive to bid actual values
- Specific design considerations
  - Auction type, collusion, price variation, hoarding, reserve prices, information disclosure, etc.
- Conclusions

U.S. Public Emission Auctions

- SO_2 allowances under acid rain program
- Virginia NO_x auction
- Regional Greenhouse Gas Initiative (RGGI)

SO_2 Allowance Auctions

- Annual (March) since 1993
- Design specified in the 1990 Clean Air Act
  - Purpose: liquidity, market entry, anti-hoarding
  - Under 3% of allowances auctioned
  - Allowances taken from firm accounts and revenues rebated to firms
  - Not pre-tested
  - Design chosen to redistribute rents to Midwestern states
  - Large academic literature *ex post*

Virginia NO_x Auction

- Regional cap on seasonal NO_x emissions
- Most allowances grandfathered with updating
- Large budget shortfall led to approval of auction
  - Purpose: raise maximum revenue
  - Design based on expert advice and experimental tests
  - Allowances taken from new source set-aside: 8%
  - Two vintages: 2004 and 2005; never repeated
- Design process was rushed but deliberate
- Ascending clock; closing price 'above market'

RGGI CO_2 Allowance Auctions

- Ten-state cap on electricity sector CO_2
- Over 90% of allowances auctioned
- Influenced by EU and Virginia experiences
  - Purpose: raise revenue for public purposes
  - Design process included literature review, expert advice, experimental tests, stakeholder process
  - Two vintages sold: 1 current, 1 future
- Uniform price, sealed bid design chosen
- Five auctions have been held to date

Why auction?

- Selling assets presents an insurmountable principle-agent dilemma to government
  - Auctions are a way of circumventing this
- Auctions support rather than supplant markets
  - Discovering market valuations
  - Avoiding unnecessary transaction costs
- Revenue is not the only reason to auction
- But we know that revenue is important

What do Governments Auction?

- Physical assets or harvest rights
  - Oil leases, timber, land, fishing rights
- Financial instruments, usually debt
  - Treasury bills, municipal bonds
- Use rights
  - Electromagnetic spectrum
  - Emission allowances
- Reverse auctions for procurement

The Auction Design Process

- There are three essential components to an effective auction design process:
  - Theoretical analysis of incentives
  - Experimental testing of key conclusions
  - Monitoring of results and mid-course changes
- As with any engineering project, there is plenty of room for good hunches and educated guesses

Criteria for Judging Outcomes

- Private sellers just want to make money, simple
- For public sellers it is more complicated
  - Efficiency may also be an important consideration
  - Fairness and transparency
  - Low transaction costs
  - Compatible with private markets,
    - Price discovery and not adding market volatility
    - Electricity markets
  - Fair revenues to government
  - Avoid collusion and hoarding

Essential Auction Attributes

- The primary attribute for a successful auction is competitiveness
  - If there are many buyers independently bidding for a uniform good, most other things will take care of themselves
- It helps if bidders have incentive to bid their true values for the good

RGGI Auction Design Methodology

- Literature review
  - Theory of mechanism design
  - Empirical assessment of past auctions
  - Field experience
- Experiments
  - > 100 lab sessions
  - > 1,000 subjects
  - > 1,000 separate auctions

Auction Forms Considered

- Sealed-bid
  - Discriminatory: pay as bid
  - Uniform price: all pay the value of the first rejected bid
- Ascending (English) clock
  - Auctioneer announces increasing prices
  - Bidders bid quantities for the announced price
- More exotic forms including combinatorial and Dutch auctions were not extensively tested

Summary of Experimental Results

- Uniform price sealed bid did not always do best but was always one of the best.
- Discriminatory did poorly at price discovery
- The Clock did much worse in collusion tests
  - Probably by lowering the number of dimensions of cooperation
  - Adding excess demand information did not help
- With a loose cap (barely binding) discriminatory started well but faded with time

Design Elements Not Tested

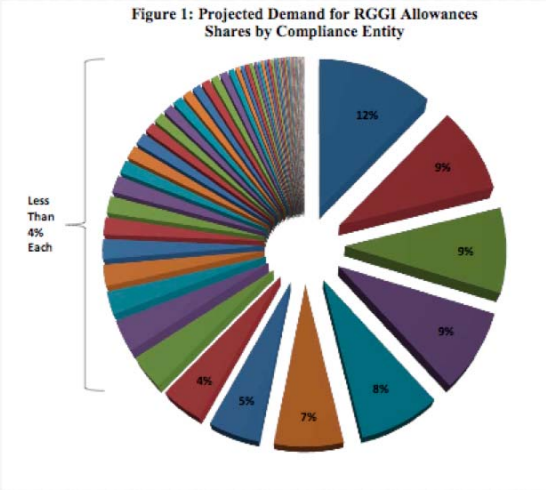
- Timing
  - Frequency
  - Sale of future vintages
- Reserve price rule
- Impact of offset triggers
- Information disclosure after the auction
- Financial assurance rules
- Uniform auction rules and timing among states

RGGI Auction Design Choices

- Type: Uniform price, sealed bid
- Timing: Quarterly
- Vintages: current and 1st from next compliance period sold separately
- Open to all participants with a 25% share cap
- Reserve price: $1.85 with move to market-based reserve
- 100% financial assurance required

How Have RGGI Auctions Done?

Are they Competitive?



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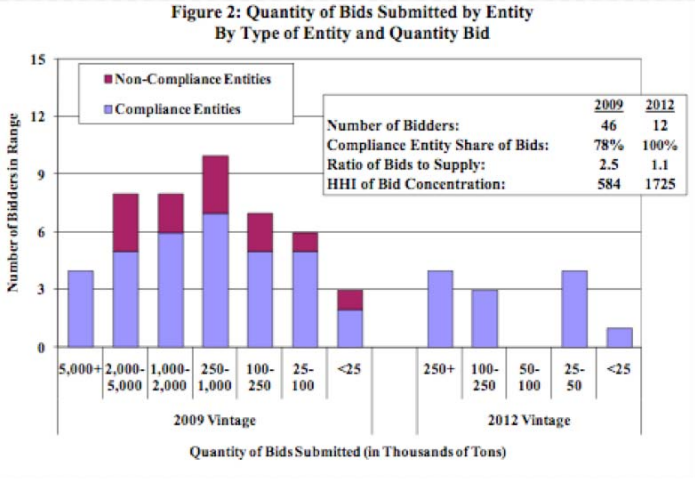
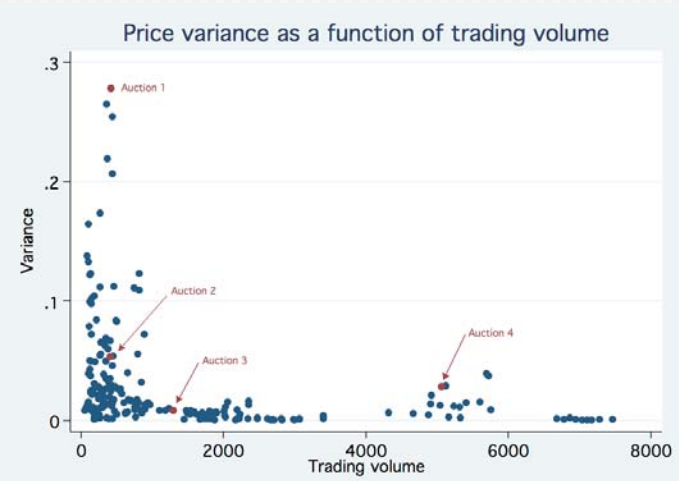


Can a Sealed Bid Auction Help with Price Discovery?



Issues to Consider

- Price discovery
- Participation
- Opportunities for profiting from hoarding
- Setting a reserve price
- Preferences for ‘weak’ bidders
- Reporting on auction results
- Frequency of auctions
- Financial assurance requirements

Price Discovery

- First principle: liquidity is not demand
  - Auctions can do at least as well as small OTC trades
- The uniform price, sealed-bid auction has performed well in predicting future prices
- Even in periods of high volatility
- With sufficient volume in the secondary markets, all auction forms should perform well
- It is doubtful that an ascending auction form will have much, if any, advantage

Participation

- Widest participation is critical to auction performance.
- Limiting bidding to ‘naturals’ would facilitate collusion and induce under-bidding at the margin (demand reduction)
- Limits on the level of individual participation can be costly and hard to enforce

Hoarding

- You can’t just buy to increase the price and then sell at the higher price
- Some worry about a ‘green squeeze’
  - This would be *very* expensive
  - It’s not just an auction issue
- Low carbon generators may raise competitors costs by raising allowance prices
  - But they would have to retire the emissions, otherwise the bank will grow

Setting a Reserve Price

- A reserve price is very important
  - If competition fails to materialize
  - In case of 'demand reduction' in a sealed-bid, uniform price auction (slack demand)
  - Catastrophic examples from past auctions
- The reserve price is not for maximizing revenue but for protecting auction credibility
- A binding reserve may be seen by the public as a failure; RGGI is very risk averse to this

More on Reserve Prices

- Should unsold allowances be retired or rolled forward?
  - The reserve should probably not be used to adjust the cap
  - But it may be useful in controlling price volatility as part of a price collar mechanism
- More research is needed in this area!

Preferences for weak bidders

- When bidders have different access to expensive information or to capital markets, giving preferences may boost revenue
- An auction for small lots of a uniform commodity like allowances does not fit this case.
- The secondary market provides price information and access
- Bidder preferences would interfere with price discovery

Frequency of Auctions

- The guiding factor is maximizing the competitiveness of the auction
  - More frequent means lower capital requirements
  - But could mean fewer participants
- In a small market, frequent auctions could make collusion easier
- Firms prefer to ‘cover’ their emissions, so reducing frequency may have costs for them

Reporting Auction Results

- This is a case where too much openness can be a very bad thing
  - Facilitating collusion and revealing sensitive private information
- Public credibility requires reporting basic summary information
- RGGI chose to keep the names of winning bidders private as well as any detailed bid info
- The market monitor reports on each auction

Financial Assurance

- RGGI requires 100% escrow to cover any bids
  - Virginia did as well
- This requires large costly capital commitments
- Would some other amount be sufficient?
  - 50%, 30%, 20%
- Brokers report that some potential bidders are put off by these high capital requirements
- More work is needed here

A Few Other Things

- Transaction costs should be kept as low as possible
  - Traders in the Virginia auction complained about the time commitment
- Reducing the number of vintages would help reduce costs and uncertainty
  - RGGI could have had one vintage per 3-year compliance period
- More research is needed on how different vintages should be sold

Thank You

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