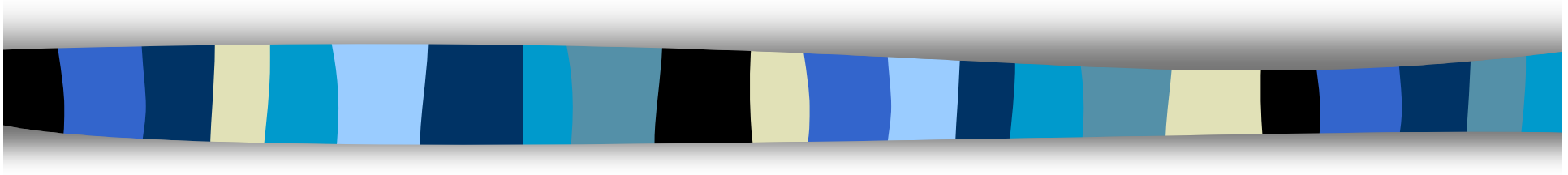
Bilateral Negotiations with Fees



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Negotiation Technology

- Structures and mechanisms
  - Structures: architectures, facilities, negotiation languages, finding tools, &c.
  - Mechanisms: rules that specify allocations as function of messaging history
- Mechanism performance varies greatly
- No “cookbook”
- We focus on the interaction between rules and fees:
  - fees may help solve performance problems
  - or can cover costs, but with varying effects

Problem of bilateral negotiation



(True value: $5)





Key: Unknown agent values from overlapping distributions

- If both truthfully bid their values, then always trade when $b=v^b > v^s=s$
  - But agents want to shade bids so miss some $v^b > v^s$ trades
- If mediator announces fixed price p, then always trade if $v^b > p > v^s$, but not if $p > v^b > v^s$ or $v^b > v^s > p$

Deep problem

- When buyer/seller distributions overlap, NO mechanism of any sort can obtain all efficient trades while maintaining (ex post)
  - voluntary participation (IR)
  - rational behavior (IC)
  - no deficit for the mediator
    (Myerson & Satterthwaite 1983)

Pragmatic mechanism design

- Relax requirements
  - Ex ante vs. ex post?
  - Allow some deficit?
- Design to obtain constrained efficiency subject to requirements
- Assess performance of practical mechanisms with simulations and experiments when analytics intractable

Generalized Vickrey Auctions

- General purpose tool, guarantees full efficiency, IC and IR
  - even if multiple goods, multiple units, externalities (Varian & MacKie-Mason 1994)
  - but not budget balance (E[D]=0)
- For bilateral negotiation, it's simple: If b > s, buyer pays s, seller receives b
  - Truthtelling is dominant strategy, so always trade if $v^b > v^s$

GVA example

- Traditional: Suppose v^s=5, s=10, v^b =10, b=5: No trade.
- GVA: Buyer pays s=5, seller receives b=10.
- Deficit: max[$v^b > v^s$, 0]
- Suppose fee=2.5 each:
  - D = 0, both gain 2.5 if they participate
  - Balance budget, but lose some efficiency

Iterative GVA with fees

- Non-participation reveals some information about location of value
  - So, when one agent doesn't participate, re-compute fee and run another round
  - Potential to recapture lost trades
- Key: If choose fee, t, such that E[D]=0 then effectively restricts trades to region without overlap: refine trading region in iterated rounds

Evaluation

- Benchmark GVA:
  - E[gain]=1/6, E[D]=1/6
- With fees, E[D]=0:
  - 1 round: E[G] = 50%
  - 4 rounds: E[G] = 94%
  - Note: Overestimated for r>2 because assumes truthtelling

k-Double auctions

- Want trades with $v^b > v^s$
  - GVA gets them with $p^b = v^b > v^s = p^s$ with a deficit
  - k-double balances budget by setting $p = p^b = p^s = kb + (1-k)s$, $0 < k < 1$
  - "splits the difference" when b-s>0
- Problem: Since p=p(b,s), incentive to shade bids, lose some efficient trades

k-Double vs. GVA

- If trying to raise 1% of E[G] with fees:
  - k-double better with rounds ≤ 2
  - GVA better with rounds ≥ 3
  - but: assumes GVA truthtelling, and same operating costs

What type of fees are best?

- Costs might vary by #bids or #transactions
- Thm 1: If costs increasing in #bids, then ☞ an entry fee equilibrium with at least as high gains as optimal linear transaction fee equilibrium
- Thm 2: If costs increasing in #transactions, ☞ a transaction fee equilibrium that beats optimal linear entry fee equilibrium

Summary

- Not all automated auction mechanisms created equal
  - Choice of rules affects performance: gains from trade, seller revenues, mediator deficit
- Our results:
  - how to use fees to maintain budget but get good efficiency
  - how to design fees based on the nature of operating costs