Ex-Post Aware Games

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New Category of Games

A game is Ex-Post Aware (EPA) if, at the end of the game, it is obvious to each player i whether any other player j has played a strategy that i was unaware of

Examples

- English Auction is EPA, because any "cheating" leads to an outcome other than "object goes to highest bidder at the bid price"
- Second Price auction is not EPA, because auctioneer could lie about 2nd bid to extract higher payment

More Examples

- Many negotiations are EPA–one party makes an offer, the other accepts or rejects
- Most contracts are not. For example, both an employer and employee can behave in ways that are unobservable and impact the other players payout

Corporate Finance

- Bonds are (mostly) EPA–either the company goes bankrupt, or pays back the bond
- Equity is not–It is unclear what an early stake in a small company means as that company grows (and we routinely see this play out in court)

Preceding Work

This idea is most similar to the concept of Obvious Strategy Proofness (OSP) (Shengwu Li 2017, AER)

- A rough definition: A game is OSP if there exists a strategy such that, at each decision point, the worst possible outcome playing your strategy is no worse than the best possible outcome playing any other strategy
- This is a strengthening of Strategy Proofness, which is roughly the same as having a dominant strategy for some subset of the players

OSP Example

- Consider English Auction
  - At each price called out, you must choose to stay in or leave.
  - Consider strategy stay in unless price $>$ personal valuation
  - Worst outcome playing strategy is payout of Zero
  - At each decision point best possible outcome from exiting is zero payout

Connection to Obvious Strategy Proofness

1. Claim: OSP $\not\Longrightarrow$ EPA + SP
2. Conjecture: EPA+SP $\Longrightarrow$ OSP

Counter Example for Claim 1:

Consider this sequential game:

1. Alice chooses Left or Right.
   - Alice believes that if she chooses Left, both she and Bob get payout of 1
   - If Alice chooses Right, Bob will flip a fair coin, giving payout 2 to one player, and payout 3 to the other, depending on the outcome (but will not show the coin to Alice)

Note that this is OSP, because it is "obvious" that Alice should choose Right, but it is not EPA because if Bob has an additional strategy available (ie. cheating by just declaring the coin toss in his favor), Alice would never know

Proof Idea for Conjecture 2

- OSP $\implies$ SP (trivially)
- The main idea for OSP $\implies$ EPA is that if a mechanism is SP but not OSP, it means the market designer could cheat without being detected.

Next Steps

- Better tie this to OSP
- Consider whether this explains behavioral results (eg, ambiguity aversion)
- Intersect this with k-level reasoning, and consider when people might choose higher or lower-reasoning counterparties to contracts?