Applications of Moment Inequalities: Ho (2009)

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Economics 258

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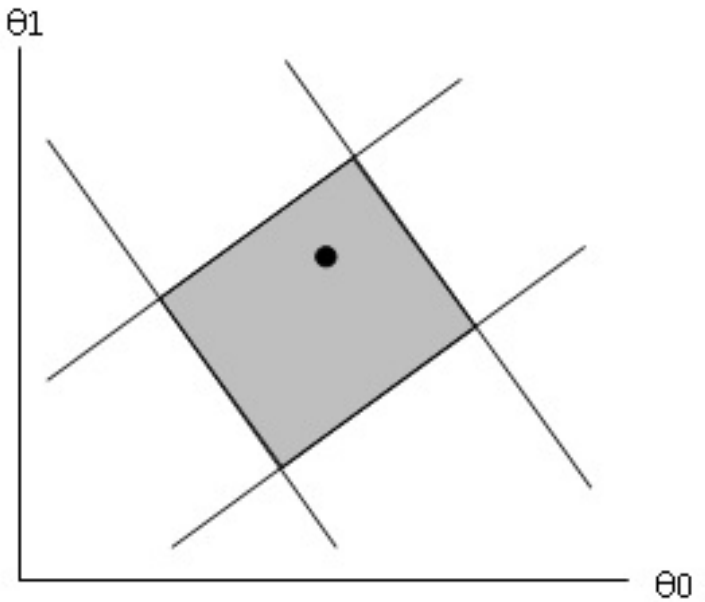
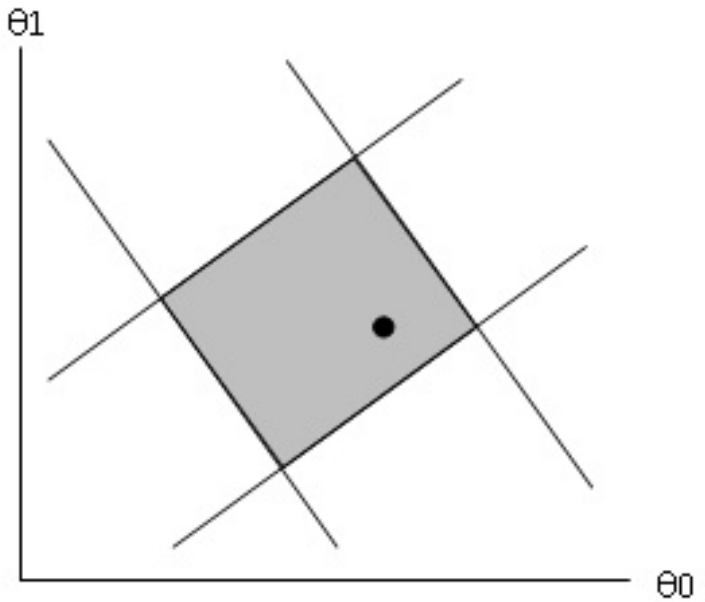
Identified Set

- Moment inequalities will generically lead to set identification. Given a set S of moment inequalities, the identified set is:

$$\Theta^S = \underset{\theta}{\text{argmin}} \sum_{s=1}^{S} \left(\min \left\{ 0, \mathbb{E}[m_s(Y, X, Z; \theta)] \right\} \right)^2$$





Steps for Estimation

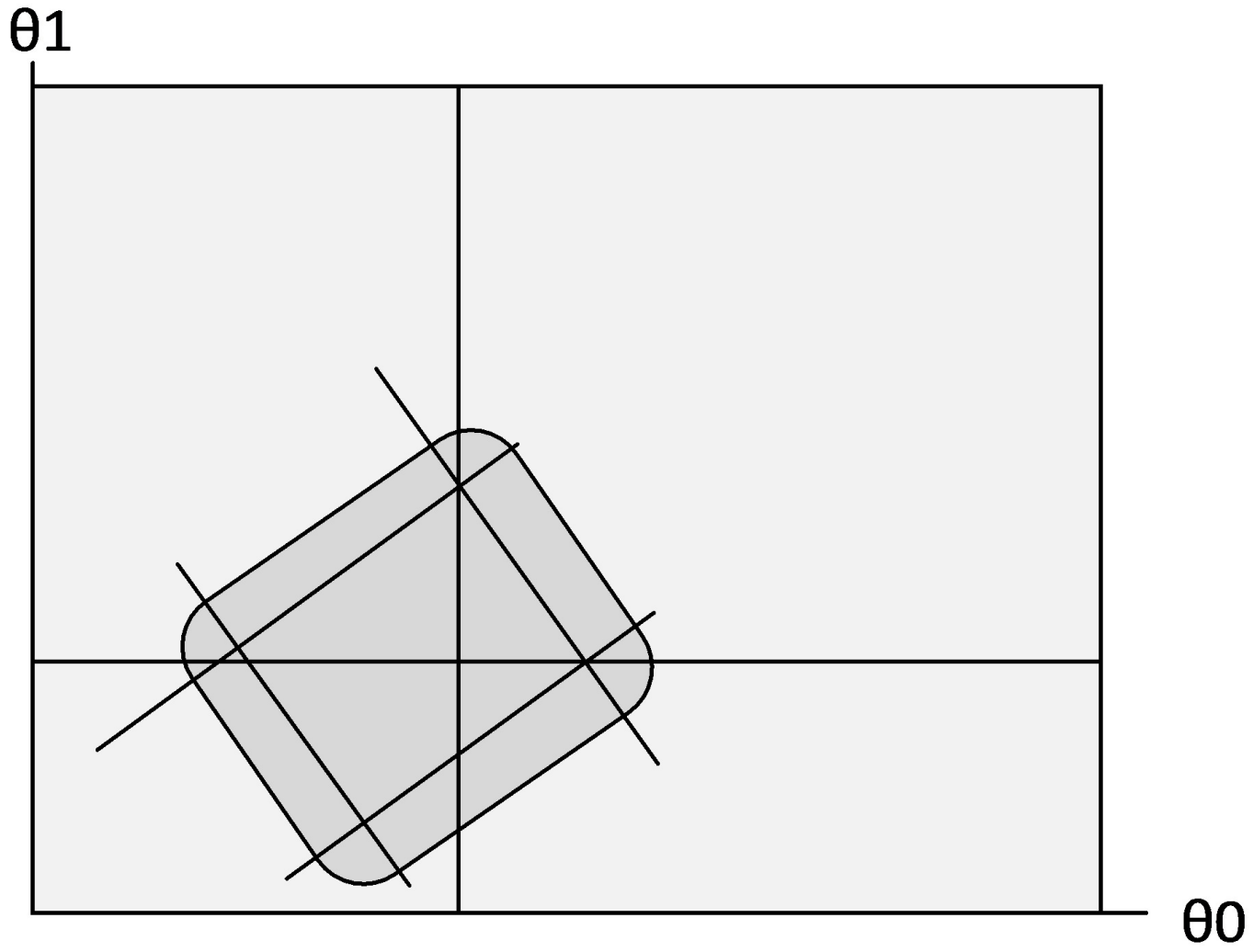
- Step 1: Estimate the identified set given sample moments.
- Step 2: Perform inference on one or more of the following parameters:
  - Interval contained in the identified set: Pakes, Porter, Ho and Ishii (2011).
  - Identified set: Chernozhukov, Hong and Tamer (Econometrica, 2007).
  - True parameter vector: Andrews and Soares (Econometrica, 2010).

Set/Point Inference: General Intuition

- Based on the inversion of an Anderson-Rubin T statistic.
- General steps in the algorithm:
  1. Define θ grids, $\widehat{\Theta}_n^{Grid}$ and $\widehat{\Theta}_n^{\epsilon}$, where $\widehat{\Theta}_n^{\epsilon} \subset \widehat{\Theta}_n^{Grid}$.
  2. Calculate $T_r(\theta)$, at a set of points in either $\widehat{\Theta}_n^{Grid}$ or $\widehat{\Theta}_n^{\epsilon}$ depending on whether the focus of inference is the identified set or the true value of the parameter.
  3. Determine a critical value as a quantile of $T_r(\theta)$ for $r = 1, ..., R$
  4. Calculate $T^{obs}(\theta)$ at each $\theta \in \widehat{\Theta}_n^{Grid}$ with the observed data for all moments.
  5. Define the confidence set as those θ points where $T^{obs}(\theta)$ falls below the critical value.

Forming the Grids: $\widehat{\Theta}_I^{Grid}$ and $\widehat{\Theta}_I^{\epsilon}$

$\widehat{\Theta}_n^{\epsilon} \subset \widehat{\Theta}_n^{Grid}$



Ho 2009

- Theory testing
- Measurement
- Methodology

Ho 2009

- Theory testing
  - Can a bargaining model explain the hospital-insurance plan contracting process, rationalizing the observed network of hospital-plan relationships?
- Measurement
  - What characteristics of hospitals and plans explain the level of surplus hospitals can extract from the relationship?
  - What is the effect of capacity constraints on producer welfare? Might the level of capacity be a relevant choice variable for a profit-maximizing firm?

Ho 2009

- Methodology
  - What assumptions are needed on behavior to develop a moment inequality estimator for static contracting problems?
  - What can information on ex-post network formation reveal about private negotiated prices?

Ho 2009

Main Idea

- Model demand for hospitals and health plans, accounting for the hospital network of each plan in the consumer's plan choice
- Model the supply side negotiation between hospitals and plans in forming equilibrium networks, which determines the division of profits
- To increase their share of the surplus from contracting, hospitals have incentives to:
  - Invest in quality to attract more patients, lower costs
  - Merge with other providers, to improve bargaining position
  - Under-invest in capacity

Ho 2009

Main Idea

- Findings
  - "Star" hospitals capture $6700 more per patient than other providers, on costs of $11,000
  - Hospitals with capacity constraints have markups of $6900 per patient more than those without constraints
  - System hospitals have $180,000/month greater profits than other providers

Ho 2009

Model: Stages

- 0. Plans choose quality and products; Hospitals choose capacity, location, product mix, system mergers.
- 1. Hospitals make simultaneous take-it-or-leave-it price offers to all plans in the market
- 2. Plans choose whether to accept these offers, forming their hospital network
- 3. Plans set premiums to maximize profits after a change in networks
- 4. Consumers and employers jointly choose plans
- 5. Sick consumers visit hospitals; plans pay hospitals per service provided.

Ho 2009

Model: Negotiation

- All hospitals make TIOLI offers of {contract,null offer}
- All plans simultaneously respond
- Offers are private info; plans have passive beliefs (if plan gets an alternative offer from h, doesn't change plan's beliefs about offers h makes to its competitors)

$$\pi^P_{j,m} = S_{j,m}(H_j, H_{-j}) - c^{Hosp}_{j,m}(H_j, H_{-j}, X, \theta) - c^{nonhosp}_{j,m}(H_j, H_{-j}, X, \theta$$

$$\begin{aligned} \pi^{P,o}_{j,m}(.) &= \pi^P_{j,m} + \mu_{j,H_j} \\ E[\pi^P_{j,m}(H_j, H_{-j}, X, \theta)|Ij, m] &= \pi^P_{j,m}(H_j, H_{-j}, X, \theta) - \varphi_{j,H_j} \end{aligned}$$

Ho 2009

Model: Negotiation

- Key assumption: plan j's expected profits from $H_j >$ expected profits from alternative network formed by reversing contract with h

$$E[\pi^{P,o}_{j,m}(H_j, H_{-j}, X, \theta) - \pi^{P,o}_{j,m}(H^h_j, H_{-j}, X, \theta)|Z_{j,m}] \geq 0$$

- form unconditional moments using positive-valued function of $Z_{j,m}$
  - must be known to firms when they make their choice
  - use char in fixed cost and markup terms other than cost/admission
  - use indicators for some plan and market characteristics

Ho 2009

Model: Negotiation

- Choose counterfactuals of reversing a single contract.
- Plans may respond by changing its response to other hospital's offers (passive beliefs rules out the following: plan responds to changes in h's offer by assuming other plans have different offers and therefore change their own networks)