

Maxims for Epistemic Game Theory

What (Not) to Do in the Epistemic Game Theory Program

Pierpaolo Battigalli

Bocconi University

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Introduction

Over the years I realized I was following some tacit methodological principles in my *epistemic game theory* (EPG) work.

I am becoming more articulate and explicit. Such principles are distilled and spelled out below as “maxims for EPG”.

“*Maxims*” instead of “*principles*”: I am trying to convey the idea that I do not want to take myself too seriously.

Topics

- 1 Expressibility
- 2 Rationality and Choice
- 3 Knowledge and Belief

Expressibility

Explicit is better than implicit.

- State *all assumptions* about game, players' behavior and beliefs using *primitive terms* (like atomic sentences) and *terms derived from other terms* (like formulas).
- **Semantic approach to EPG [2, 1999], [1, 2007]:**
 - basic facts, *expressions, descriptions* [5, 1998],
 - assumptions=events in *canonical type structure* generated by basic facts [6, 1985], [2, 1993].
- **Yes:** rationalizability= $\text{proj}_{Strat} RCBR$, **No:** interim indep. rationalizability [4, 2006], [3, 2007], [3, 2011]. **Maybe:** CP, epist. cond. for Nash [1, 1995].

Rationality and Choice

Strategies cannot be chosen: rationality is for actions, rational planning is for strategies.





- Rationality is about choice, only *actions* can be (irreversibly) chosen, strategies can only be planned: \max_{a_i} not \max_{s_i} .
- *Rational planning*=dynamic programming on subjective decision tree (given beliefs about others)→epistemic strategy.
- *Rationality*=actual behavior consistent with rational planning.
- Ability to express *intentional vs unintentional* actions.
- **Yes:** $CommStrongBel(RatPlan \cap Cons) \Rightarrow BI\text{-path}$ [4, forth.]
No: dynamic EPG without Bayes rule.







Knowledge and Belief

Belief is not knowledge: beliefs and rationality cannot be known, but they can be believed.

- *Belief*: subjective epistemic state of certainty, fallible (KD45, non-reflexive possibility correspondences).
- *Knowledge*: justified true belief coming from introspection, observation, logical deduction (S5, partitioned correspondences).
- *Beliefs* (probabilistic or qualitative) *of others cannot be known* (but some correlates may be observed), *only past actions may be known, rationality is un-knowable, but believable.*
Distinction crucial in dynamic EPG.
- **Yes**: Common Belief in Rationality, Knowledge of own-preferences; **No**: Common Knowledge of Rationality; **Maybe**: Common Knowledge of preferences.

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