

Rationality and the Bayesian Paradigm

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Probability – Whence?

- What is the probability of
- A coin coming up Head?
- A car being stolen?
- A surgery succeeding?
- A war erupting?

Objective Probabilities

- Exist in simple cases (iid)
- Can be defined with identity, as long as causal independence is retained
- Rule-based approaches: logit
- Case-based approaches: empirical similarity
- But none extends to the cases of wars, stock market crashes...

The Bayesian Approach

- Formulate state space
- All uncertainty resolved by the state
- Formulate a prior probability
- Update by Bayes's rule

Rationality and Bayesianism

- Pascal and Bernoulli
- Ramsey and de Finetti
- von Neumann-Morgenstern
- Savage
- Anscombe-Aumann

What's in a State?

- de Finetti, Harsanyi, Aumann
- Newcombe: also causal relationships
- A problem for a behavioral derivation
- Where would the probability come from?

Subjective Probability

- Normative interpretation: completeness?
- If it's so rational, why isn't it objective?
- Are all Arbodites Cyclophines?
- The Bayesian approach is good at representing knowledge, poor at representing ignorance

Alternatives to the Bayesian Approach

- Schmeidler (1989): non-additive probabilities (capacities)
- Integration by Choquet's integral
- Maxmin EU: there exists a set of probabilities C such that

$$V(f) = \min_{P \in C} \int_S u(f(s)) dP(s)$$

Other Multiple-Priors Models

- Nau, Klibanoff-Marinacci-Mukerji: “smooth preferences”

$$\varphi : \mathbb{R} \rightarrow \mathbb{R}$$

$$\int_{\Delta(S)} \varphi \left(\int u(f) dp \right) d\mu$$

- Maccheroni-Marinacci-Rustichini: “variational preferences”

$$V(f) = \min_{P \in \Delta(S)} \left\{ \int_S u(f(s)) dP(s) + c(P) \right\}$$

Applications

- Finance: home bias (Epstein-Miao, 2003); coherent risk measures (Artzner, Delbaen, Eber, Heath, 2001)
- Macro: equity premium (Hansen-Sargent-Tallarini, 1999); robustness (Hansen-Sargent, 2008)
- Climate Change (Heal Millner, 2013)