Hedging priors (A teaser)

Johannes Gierlinger
Toulouse School of Economics (LERNA)

RES meeting

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Ambiguity vs risk

- Uncertainty is a risk that can’t be measured. (Knight, 1921)
- Knowing **exact** model is demanding: sophisticated securities, long horizons.
- Blanchard, Jan 2009:

  “When, as today, the unknown unknowns dominate, and the economic environment is so complex as to appear nearly incomprehensible, the result is extreme prudence, if not outright paralysis […]. And this behavior, in turn, feeds the crisis.”
Observed choices: A variant of Ellsberg’s 2-color experiment

- Prize if ♥:
  Cake
  (6in vs 2in).

- Alternative situation:
  1 card is missing.
  Don’t know which.

↑ Prob 2/3.
Else:
Observed choices: A variant of Ellsberg’s 2-color experiment

- On average the odds are the same. EU: must be indifferent.
- AA: Prefers to know the odds. Ellsberg (1961).
- Axioms $\implies$ extra weight on unfavorable probability models.

$$\max-min \quad \leftarrow AA \quad \rightarrow EU$$

$$u(2) \quad \frac{1}{2} u(2) + \frac{1}{2} u(6)$$
Policy

- Representative agent models.
  - Problem: Negative aggregation result. Gajdos et al. (JET 2008).
- No uncertainty on aggregate: EU-type equilibria.
- Uncertainty on aggregate: No characterization.
  - Number of equilibria is finite: Rigotti, Shannon (2008).
- This paper answers:
  1. What should policy aim for?
  2. Can we quantify the distortions due to ambiguity?
  3. Who should bear ambiguity?

key More general contracts allow for full characterization.
Adding AA

- Two agents: □■.
- Share the cake.
- Policy: Ambiguity affects risk taking.
- Literature: AA reinforces risk aversion. Say ■ is AA.
- Literature: □ demands a bigger share at worse outcomes.
General contracts

- Why do we only contract on outcomes?
- No loss of generality under EU.
- But: AA and EU “disagree” about importance of worst probability model.
- Gains from trade under AA.
Proxies make a difference

- Learning the true model is demanding.
- A proxy is still valuable.
- A signal is useless ("redundant") iff $G = F$.

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σ ∼ F
σ ∼ G
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Contracting on $\sigma$ increases the "span".

**Proposition**

*Even if all agents agree on local trade-offs between payoff-relevant states, an allocation need not be Pareto optimal under ambiguity aversion.*
Risk taking

- 2 period exchange economy with smooth ambiguity preferences.
- $N$ heterogeneous agents (risk $\succeq$, ambiguity $\succeq$, endowments).
- Look for PO functions $x_i : S \times \Theta \rightarrow \mathbb{R}$ which assign consumption for each state $s$ and each model $\theta$.

Proposition

*In each probability model $\theta$, risk will be shared in a way which would be Pareto-optimal if all agents were expected utility maximizers with $\phi_i$ linear.*
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Implementation

Introduce competitive and complete markets for claims contingent on \((s, \theta)\). Think of variance swaps, index-based weather insurance etc.

Proposition

The pricing kernel on securities is monotonic in \(\theta\) if one of the following conditions hold.

1. Risk scenarios \(\theta\) can be ordered according to first-degree stochastic dominance (FSD).

2. Individuals exhibit identically sloped harmonic risk aversion (ISHARA) and scenarios are ranked according to one agent’s preferences.

Proposition

If preferences are of the ISHARA class, then any complete market equilibrium can be replicated by a mutual fund, a risk-less asset and risk contingent swaps.
Take home messages

1. Definition of contract space is crucial for results in ambiguity literature.
2. This is the first efficiency benchmark on how to share ambiguity.
3. Implementation requires speculative bets on probability models.

Agenda

- Experiment (together with Sarolta and A.K. Wagner).
- Aggregation of preferences.