PhD Proposal and Monitoring

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European Doctorate in Economics - Erasmus Mundus (EDE-EM)

EDE-EM Winter meeting, Lisbon
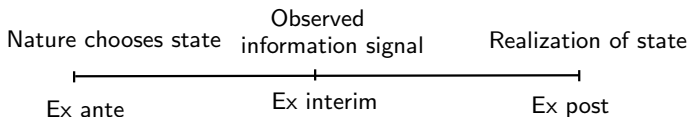
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Introduction

- Name: Yuanyuan LI

- Education: B.S. in Applied Mathematics, 2007;
  Master in Economics, 2009;
  Master in QEM, 2011.

- Advisors: Prof. Bernhard Eckwert
  Prof. Bertrand Wigniolle

- Mobility Track: Bielefeld —— Paris —— Bielefeld.

- Proposed Title:

  Information and the Dispersion of Posterior Distributions

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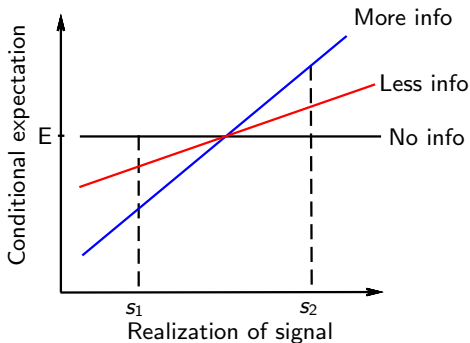
Uncertainty and Information

- Imperfect knowledge and uncertainty (returns of investment, workers' skill, exchange rate, ...)

- Availability of information (purchasing, expert's advice, monitoring,...) $\longrightarrow$ reduce the uncertainty.

- Timing of events

Nature chooses state — Observed information signal — Realization of state

Ex ante — Ex interim — Ex post

- Decision making based on **posterior distributions**.

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How do different signals affect the posterior distribution?

- More useful info. $\to$ larger impact $\to$ more sensitive actions

- Extremely, fully uninformative $\longrightarrow$ posteriors $\sim$ priors
  $\longrightarrow$ conditional expectation = unconditional expectation.

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Information Structure and Revision of Beliefs

- The triplet (Ω, Y, F) is defined as **an information structure**.
    - Ω is the set of unknown states;
    - Y is the set of signals;
    - F is a stochastic transformation from Ω to Y, represented by the conditional density functions $f(y|\omega)$.

- For a given prior $\pi(\cdot)$, agents can obtain the **updated beliefs** via Bayes' Rule:

$$\nu(\omega|y) = \frac{f(y|\omega)\pi(\omega)}{\mu(y)}, \quad \forall \omega \in \Omega, \forall y \in Y.$$

  where $\mu(y) = \int_{\Omega} f(y|\omega')\pi(\omega')d\omega'$.

- Making decisions based on the posterior distribution.

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Informativeness and Dispersion Criteria

- Ordering of information structures

  - Blackwell's informativeness(1953) — the value of information

  - Lehmann's effectiveness(1988) — conditional distribution

  - Kim's MPS criterion(1995) — likelihood ratio distribution

- Precision criteria (Ganuza & Penalva, 2010)

  - A signal $\tilde{y}^F$ from (Ω, Y, F) is more **supermodular precise** than the signal $\tilde{y}^G$ from (Ω, Y, G) if $E[\tilde{\omega}|\tilde{y}^F]$ is greater in the dispersive order than $E[\tilde{\omega}|\tilde{y}^G]$.

    ($E[\tilde{\omega}|\tilde{y}^F]$ has a broader support than $E[\tilde{\omega}|\tilde{y}^G]$.)

  - Precision based on other stochastic orders (e.g.: convex order).

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Dispersion of conditional Expectations

- Transformation of signals: $z = F(y)$, uniformly distributed.

- $\tilde{y}^F$ is more **supermodular precise** than $\tilde{y}^G$ if

$$E^F[\tilde{\omega}|z'] - E^F[\tilde{\omega}|z] \geq E^G[\tilde{\omega}|z'] - E^G[\tilde{\omega}|z]$$

  for any $z, z' \in (0, 1)$ such that $z' > z$.

  That is, $\Delta E(z) := E^F[\tilde{\omega}|z] - E^G[\tilde{\omega}|z]$ is non-decreasing in z.

- Precision $\longleftrightarrow$ Sensitivity of $E[\tilde{\omega}|\tilde{y}]$ to signal realizations

- Problems:
  - unclear relationship between information structures.
  - not invariant to relabelling.

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Any link between Informativeness and Dispersion?

- Is there any relationship between informativeness criteria and dispersion criteria?

- How to characterize the dispersion criteria based on information structures?

- A Binary Example: $\Omega = \{\omega_L, \omega_H\}$, $Y = \{y_L, y_H\}$, and two info. structures (Ω, Y, F^p) and (Ω, Y, F^q), where

$$F^p = \begin{pmatrix} 1 - p_1 & p_1 \\ p_2 & 1 - p_2 \end{pmatrix} \quad and \quad F^q = \begin{pmatrix} 1 - q_1 & q_1 \\ q_2 & 1 - q_2 \end{pmatrix}$$

with $p_1 + p_2 \leq 1$ and $q_1 + q_2 \leq 1$.

Informativeness in Blackwell's sense
$\implies$ Dispersion of conditional expectations.

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Methodology and Expected Outcomes

- Methodology

  - Probability theory and mathematical statistics

  - Dynamic equilibrium theory

- Expected Outcomes

  - Establish the relationship between informativeness and dispersion criteria.

  - Form Characterizations of dispersion criteria.

  - Applications on financial market theory based on dispersion criteria (market transparency and financing probabilities, expected returns, market (in)stability, etc.)

Progress and Plans

- Courses:
    - S1: Econometrics, Labour Economics with Search Frictions;
    - S2: Stochastic Orders and Applications, Information Economics Seminar.

- Research Seminars: Economics Seminar, BiGSEM Colloquium.

- Language Course: German

- Attending the 6th EBIM Workshop and the 10th anniversary of BiGSEM.

- Research Work (in progress): Informativeness and Dispersion in discrete cases.

The end...

Thank you for your attention.