BANCO DE ESPAÑA

Business Cycle Dynamics under Rational Inattention

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Discussed by:

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This paper

- **Embed Sims' "rational inattention" mechanism,**
  based on **information entropy flow constraint,**
  - –Motivation: information processing costs
  - –The math: from telecommunications engineering

  inside **DSGE framework** with standard elements
  - –perform standard quantitative exercises (IRFs)

  and idiosyncratic shocks.
  - –study interaction of multiple information processing tasks

Main findings

- **Sluggish response of prices to monetary shocks**
- **Strong real responses to monetary shocks**
- **Firms react strongly to their idiosyncratic shocks**

- Idiosyncratic shocks **divert attention** from money shocks
- **But greater monetary variance** implies more errors in response to money shocks

- **Similar to Calvo, but firms make smaller mistakes**

Progress in rational inattention models

- **Sims (2003)** "... Rational Inattention"
  - Choose **best predictor of *X*** s.t. information flow constraint
  - Partial equilibrium: *X* exogenous
- **Mackowiak/Wiederholt (2007)** "Optimal sticky prices..."
  - Monopolistic firm: choose own *p* s.t. information flow constraint
  - Aggregate *P* endogenous, also idiosyncratic shocks
- **Mackowiak/Wiederholt (2008)** "Business cycle dynamics..."
  - Monopolistic firm: choose own *p* s.t. information flow constraint
  - **DSGE context:** firms/workers, idiosyncratic shocks, Taylor rule
- **Adam (2008)**
  - Simplified DSGE; analyze monetary policy independence
- **Woodford (2008)**
  - Use information flow constraint to study **decision to buy full info**

Why not assume perfect rationality?

- **Sims:**
  "It is apparent from nearly any VAR study... that most cross-variable relationships among macro time series are smooth and delayed"
- Especially important for **monetary nonneutrality**
- **Lack of extreme contractual contingency**
- **Apparently excessive bubbles / crashes**

Alternatives to rational expectations

(1) Structural models of information processing

- **Learning**
- **Behavioral finance**
- **Finite automata, etc.**

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  - Useful for modelling how players become forgetful about historical precedents (bubbles, inflation, defaults)
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- **Behavioral finance**
- **Finite automata, etc.**
  - **General problem: arbitrary restrictions on types of strategies**
  - Robustness to change in specification?

Alternatives to rational expectations

(2) Exogenous intermittent adjustment

- Calvo (1983)

- Mankiw-Reis (2002)

Alternatives to rational expectations

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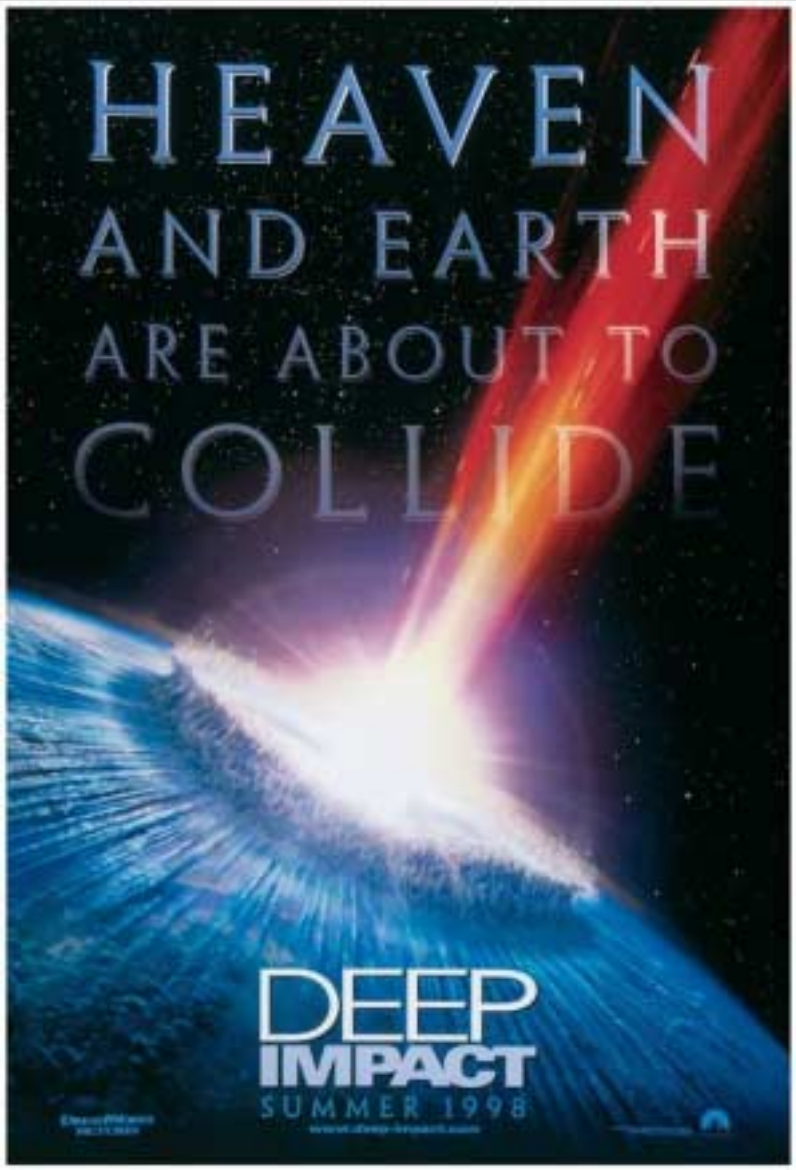
- **Calvo (1983)**
  - Far from optimal (no state contingence)
  - Lucas critique

- **Mankiw-Reis (2002)**
  - Far from optimal (no state contingence)
  - Lucas critique
  - unrealistically complex choice space (choose sequences)

The problem with Calvo and Mankiw-Reis



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  - **Mankiw-Reis motivated by information processing costs, instead of menu costs... nonetheless shares many weaknesses of Calvo.**

Alternatives to rational expectations

(3) Frameworks "close" to full rationality

- **Smart and stupid populations**
  - Akerlof-Yellen (´85); Galí-Gertler-López (´05); "noise traders", etc.
- **Sims (´03): information entropy flow constraint**
  - GE versions Mackowiak-Wiederholt (´07/´08); Adam (´08)
- **Woodford (´08): information entropy flow constraint**
  - Fixed costs of info update and menu update
- **"Generalized (S,s)"**
  - Caballero-Engel (´93/´07); Costain-Nakov (´08)
  - **All these models can be parameterized arbitrarily close to rational expectations**

The main issue

Calvo and Mankiw-Reis models can also be parameterized arbitrarily close to full rationality. **What's the difference?**

- **Should parameterize distance from rationality in a way that is robust to Lucas critique** (and meteors).

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- **Should parameterize distance from rationality in a way that is robust to Lucas critique** (and meteors).
  - Calvo, Mankiw-Reis: parameterize w.r.t. **frequency of adjustment**
  - Obviously that's not a "deep" parameter, so these models will remain vulnerable to Lucas critique

The main issue

Calvo and Mankiw-Reis models can also be parameterized arbitrarily close to full rationality. **What's the difference?**

- **Should parameterize distance from rationality in a way that is not vulnerable to Lucas critique** (and meteors).

  – "Generalized (S,s)": parameterize w.r.t. typical **value loss.**
  – For example: probability of adjustment = 50% when loss = *L**

  – Obviously vulnerable to Lucas critique if we state value in €.
  – Idea: as long as we state values in **units of time**, model should be largely robust to Lucas critique.

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- **Should parameterize distance from rationality in a way that is robust to Lucas critique** (and meteors).

  – Sims, etc: parameterize w.r.t. **maximum information entropy flow**

  – Amount of effort devoted to collecting information is likely to change if economic situation changes.
  – Idea: include **cost of information in budget constraint**, stated in **units of time**. Then model should be largely robust to Lucas critique.

Near-rationality: common findings

All 3 models (Generalized Ss / Woodford / Sims) imply:

- Degree of rationality parameterized in **Lucas-robust** way
- Can **calibrate** rationality on basis of **micro adjustment data**
- Respond **quickly to idiosyncratic / slowly to agg.** shocks
- **Damped/delayed** effects of aggregate shocks
- **Money supply shocks similar to Calvo**, but firms make much **smaller mistakes**

Near-rationality: differences

Generalized (S,s) / Woodford imply:

- Var(X) increases → **frequency** of adjustment increases

Sims-type / Woodford models imply:

- Var(X) increases → **less attention to Y, Z...**

Sims-type models imply:

- Var(X) increases → **less accurate response to X**

Near-rationality: DSGE computation

Generalized (S,s) / Woodford:

- must calculate **dynamics of distribution**

Mackowiak-Wiederholt (2008)

- Guess firm's pricing policies
- Solve optimal attention problem
- Find implied aggregate price dynamics
- Solve linear DSGE s.t. aggregate price dynamics
- Compute implied firm's pricing polices ...

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GRACIAS POR SU ATENCIÓN

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