# SELF-FULFILLING DEBT DILUTION

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Discussion by

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# INTRODUCTION

- Characterizes equilibria in Eaton and Gersovitz (1982) type model with long term debt

    - What we knew before: with short term debt, equilibrium unique

    - What we know now: if debt long-term, multiple equilibria

- Mechanism that generates multiplicity builds on feed-back between future fiscal policy behavior and current bond prices

- Simplifying assumptions, but analysis crystal-clear

# OVERVIEW OF DISCUSSION

- Preliminaries

- Multiple equilibria in sovereign debt models

    - Cole and Kehoe (2000)

    - Calvo (1988), Lorenzoni and Werning (2013)

    - Aguiar and Amador (2018)

- Two comments/suggestions

    - Differences with other sources of multiplicity

    - Make framework more "operational"

# KEY INGREDIENTS OF A SOVEREIGN DEBT MODEL

- Game between a government and atomistic lenders. Government issues state uncontingent bonds, with an option to default

- Government chooses fiscal policy (consumption, borrowing and default) to maximize $U(.)$ subject to

$$c + \delta b = y + q(b')[b' - (1 - \delta)b]$$

- No-arbitrage condition for the lenders. For example

$$q(b') = \mathbb{E}\left[\frac{1}{1 + r}D'[\delta + (1 - \delta)q']\right]$$

- Rules of the game: what can the government commit to?

# LIMITED COMMITMENT

- In all sovereign debt models, government cannot commit to

  - Repay in the future

  - Future path of fiscal policy

- Models differ on degree of commitment for the government today

  - In Eaton and Gersovitz, can commit on $b'$ and on $D$ today

  - In Cole and Kehoe, can commit on $b'$ but not on $D$

  - In Calvo, cannot commit on $b'$ (just on the resources raised today, $x = qb'$)

# CONFIDENCE CRISES

1 In E-G, equilibrium is unique when only short term debt available
  (Auclert and Rognlie, 2016)

2 In C-K, confidence crises possible

   • Lenders expect a default today and do not buy bonds

   • Govt needs to repay maturing debt by cutting current consumption

   • Might not be optimal to do so

3 In Calvo, confidence crises possible

   • Govt needs to raise $x$. If prices high, it would promise a face value $b^L$

   • Lenders expect lower prices. To raise $x$, the Govt issues $b^H > b^L$

   • Can be self-fulfilling because $q'(b') < 0$

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# AGUIAR AND AMADOR (2018)

- E-G framework

- Long maturity debt ($\neq$ Auclert and Rognlie, 2016)

- Assumptions
  - Linear utility for the government and the lenders
  - iid shocks to outside option, $V \in \{\underline{V}, \overline{V}\}$
  - Impatience, $\rho \geq r$
  - Deadweight loss from default

- Trade-off for government: Impatience vs. deadweight losses

# PLANNER SOLUTION

Consider first the solution of a planning problem that

- Respects option to default of government

- Has commitment over future spending paths

Solution can be of either two types, depending on model parameters

1. Borrowing ("Italy"): Government borrows up to endogenous debt limit $V_B(\bar{b}_B) = \underline{V}$. Risk of default

2. Saving ("Germany"): Government borrows up to the "safe" limit, $V_S(\underline{b}_S) = \overline{V}$, and save if $b \in (\underline{b}_S, b^I]$. No risk of default

# WHY MULTIPLE COMPETITIVE EQUILIBRIA?

Assume the saving allocation is a competitive equilibrium. So

$$c_S^\star(q_S) = y - \{r + \delta[1 - q_S(\underline{b}_S)]\}\, \underline{b}_S = y - r\underline{b}_S$$

and

$$V_S(\underline{b}_S) \geq V_B(\underline{b}_S)$$

Suppose now lenders think Germany will behave like Italy in the future

$$\hat{c}_S(q_B) = y - \{r + \delta[1 - q_B(\underline{b}_S)]\}\, \underline{b}_S < c_S^\star(q_A) = \rho V_S(\underline{b}_S)$$

A necessary condition for multiplicity is

$$\frac{\hat{c}_S(q_B)}{\rho} < V_B(\underline{b}_S) \leq V_S(\underline{b}_S)$$

# LOGIC OF SELF-FULFILLING CRISES IN AGUIAR AND AMADOR

- Saving equilibrium supported by high bond prices (low refinancing costs)

- If lenders are pessimistic about future fiscal policy, government today faces higher refinancing costs

- The borrowing strategy might then be optimal at those prices

Key ingredients

1 Bond prices reflect expectations of future policies (long term debt)

2 Government cannot commit to future fiscal policy

Related to Lorenzoni and Werning (2013), but in E-G framework

# COMMENT 1: DIFFERENCES WITH OTHER MULTIPLICITY

- In paper, authors emphasize C-K and Calvo are models of "crises". But there are extensions (Bocola and Dovis; Aguiar et al.; Lorenzoni and Werning)

- A key distinction is on the role of public debt management

  - In C-K, a Govt afraid of a rollover problem would want to lengthen maturity

  - Same in Calvo-style multiplicity (and in its dynamic version of L-W)

  - Here, lengthening is bad

    - Opens the door to multiplicity

    - Can select inefficient equilibrium

- Distinction could matter for measurement
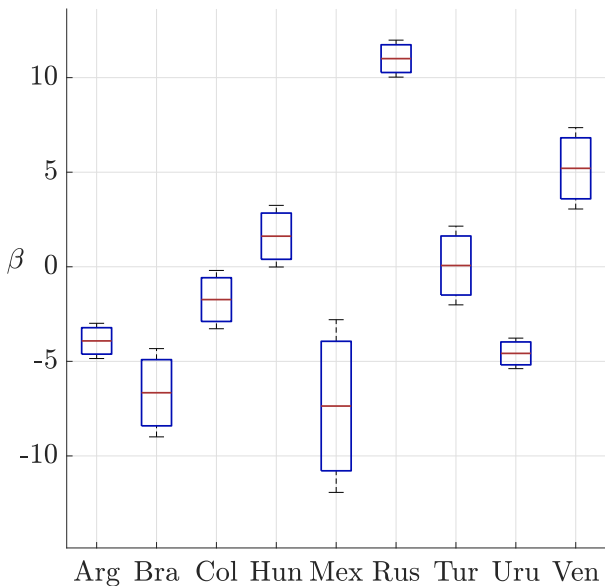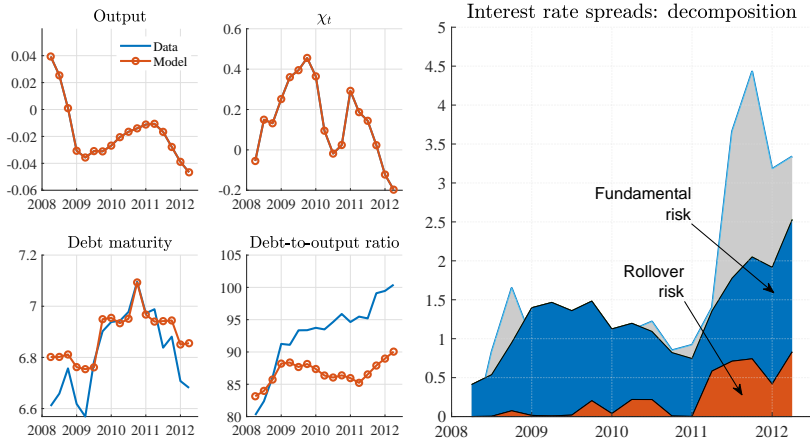
In euro crisis, mostly shortening of maturity

# SUGGESTION 1: HOW DOES AN AGUIAR-AMADOR DEBT CRISIS LOOKS LIKE?

- Experiment of a switch between saving and borrowing equilibrium

- Study dynamics of

  - Debt (increasing)

  - Spreads (increasing), more so for long term bonds (slope initially positive, then flat?)

- Helpful to understand differences with other sources of multiplicity

- Helpful to see if we match qualitatively pattern of crises in data

# COMMENT 2: TOWARD A MORE "OPERATIONAL" FRAMEWORK

Want: Procedure to compute equilibria in more quantitative framework

- Seems hard to do by brute force (need to guess pricing schedules)

- Can use theoretical results to build an algorithm

  - Is there any way we can use the planner's problem?

  - Solve competitive equilibrium for large $\delta$. Use previous solution as initial guess for lower $\delta$. Keep iterating. Do we select borrowing equilibrium, if it exists?

  - Where does the limit of finite horizon economy converges to?

Question: are there regions of fragility as in C-K?

- In C-K, indeterminacy only in regions of state space ("crisis zone")

- Also here, allocations across two equilibria differ in certain regions

- Helpful to discuss how these regions vary with parameters

# CONCLUSION

- Beautiful paper, characterizes equilibria in a benchmark model of sovereign debt

- Two suggestions

  - Explore differences with other sources of multiplicity

  - More emphasis on making framework operational

- Looking forward to learn more about it