Are Collateral-Constraint Models Ready for Macroprudential Policy Design?

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What is the paper about?

- **How is debt constrained?**
- Is it current or future income what matters?
  1) If debt is constrained by current income ⇒ Macroprudencial policy
  2) If constrained by future income ⇒ no intervention.

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  - **Mechanism:** future constraint ⇒ price effects internalized.
  - **Findings:** Data supports both types of constraint. Cost of "over-regulation" is small.

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  - **Mechanism:** future constraint $\Rightarrow$ price effects internalized.
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- **This discussion**
  - Focused on the theory. The theory is really hard to follow.

Setup

- Planner chooses allocations **without commitment**. Does it matter?

  A) What is the equilibrium concept? It is never mentioned.
  B) but, 1) independent of the history of play and 2) differentiable.
  $\Rightarrow$ it must be a **Differentiable Markov Equilibrium**.

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- Key objects: Tradable price $\mathcal{P}(C, s)$ and collateral constraint $\mathcal{D}(\mathcal{P}, s)$.

  - Current inc.: $d' \leq \mathcal{D}(\mathcal{P}(C, s), s)$ $\Rightarrow$ Bianchi (2011).
  - Future inc.: $d' \leq \mathcal{D}(\mathcal{P}(C', s'), s')$ $\Rightarrow$ Kiyotaki and Moore (1997).

  $\Rightarrow$ $d, c =$ individual choice, $D, C =$ aggregate.

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- Paper combines both in one. Focus on second, and stress the difference.

Regulation-free equilibrium

▸ Planner.

- The equilibrium can be characterized by value function $v(d, s)$, tradable consumption $c(d, s)$, debt $b'(d, s)$ and prices $\mathcal{P}(C, s)$ satisfying (among other things):

$$u'(c(d,s),s) = -\beta \mathbb{E}[v'(d'(d,s),s')] + \mu \quad (1)$$

$$v'(d,s) = -Ru'(c(d,s),s) \quad (2)$$

- where μ the is multiplier in the constraint $d' \leq \mathcal{D}(\mathcal{P}(C', s'), s')$.

- Condition (2) is the **Envelope**:
  - It does not depend on the constraint being binding or not.
  - Price depends on D not on d.
  - Key for regulation: individuals do not internalize effect on $\mathcal{P}$.

Planner's Markov equilibrium

▸ Conditions

- Every Planner takes as given future decisions and solves:

$$\max_{\{c,D'\}} \left\{u(c) + \beta \mathbb{E}_{s'}[V(D', s')]\right\}$$

$$st. \qquad c + RD \leq D' + Y^T(s)$$
$$D' \leq \mathcal{D}(\mathcal{P}(\mathcal{C}', s'), s')$$

$$and \qquad V(D,s) = u(\mathcal{C}(D,s)) + \beta \mathbb{E}_{s'}[V(\mathcal{B}'(D,s), s')]$$
$$\mathcal{C}(D,s), \mathcal{B}'(D,s), \mathcal{P}(\mathcal{C}, s) \text{ given.}$$

- V is the *continuation* value function.
- $\mathcal{C}$ and $\mathcal{B}'$ are *expected future decisions* (here $\mathcal{B}' = D'(D,s)$).

  $\mathcal{P}$ is *consistent with equilibrium* behavior.

- If we can prove that this problem satisfies (1) and (2) we are done.

Planner's Markov equilibrium

▸ Conditions

- Non-committed Planner's foc is:

$$u'(c) = -\beta\mathbb{E}[V'(D', s')] + \mu^p\left(1 - \frac{\partial \mathcal{D}}{\partial \mathcal{P}}\frac{\partial \mathcal{P}}{\partial \mathcal{C}}\frac{\partial \mathcal{C}'}{\partial D'}\right)$$

- **Step 1**: to get condition (1) assign $\mu = \mu^p\left(1 - \frac{\partial \mathcal{D}}{\partial \mathcal{P}}\frac{\partial \mathcal{P}}{\partial \mathcal{C}}\frac{\partial \mathcal{C}'}{\partial D'}\right)$.

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- **Step 2**: prove condition (2) that $V'(D, s) = -Ru'(\mathcal{C}(D, s))$.

- Note that using budget constraint we can write:

$$V'(D, s) = Ru'(\mathcal{C}) + \left[\beta \mathbb{E}_{s'}[V'(\mathcal{B}', s')] + u'(\mathcal{C})\right] \frac{\partial \mathcal{B}'}{\partial D}$$

- **If future constraint is not binding the last term is zero.**
- If binding ($\mu^p > 0$): incentives for price manipulation.

Manipulation of future planners

▸ Conditions

- With **current income** approach, when the constraint is binding:

$$\mathcal{B}' = \mathcal{D}(\mathcal{P}(\mathcal{C}, s), s) \qquad \Rightarrow \qquad \frac{\partial \mathcal{B}'}{\partial D} = \frac{\partial \mathcal{D}}{\partial \mathcal{P}} \frac{\partial \mathcal{P}}{\partial \mathcal{C}} \frac{\partial \mathcal{C}}{\partial D} \neq 0$$

- Second term is not zero, need for macroprudential regulation.

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- With **future income** approach, when the constraint is binding:

$$\mathcal{B}' = \mathcal{D}(\mathcal{P}(\mathcal{C}'(\mathcal{B}'), s'), s') \qquad \Rightarrow \qquad \frac{\partial \mathcal{B}'}{\partial D} \left(1 - \frac{\partial \mathcal{D}}{\partial \mathcal{P}} \frac{\partial \mathcal{P}}{\partial \mathcal{C}} \frac{\partial \mathcal{C}'}{\partial \mathcal{B}'}\right) = 0$$

- Then, $\frac{\partial \mathcal{B}'}{\partial D} = 0$, conditions (1) and (2) are satisfied with the μ assignment. Both solutions are the same!

- **Current planner cannot manipulate the future one**.

Final Comments

- By making the tightness of the (future income) collateral constraint random, it is possible to obtain similar key moments.
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- By making the tightness of the (future income) collateral constraint random, it is possible to obtain similar key moments.
- $\Rightarrow$ the shock tightening the constraint happens today.
- $\Rightarrow$ **models are equivalent, but imply different policies**.
- What happens if we make a mistake and tax when we should not do it? Or viceversa?
- $\Rightarrow$ **better to tax, welfare cost of mistake is small!**
- Very nice paper!