Household Heterogeneity and Optimal Mortgage Regulation

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Overview

- Two-type model with many features: default, renovations, collateral constraints, etc.
- Questions:
  - What externalities does the planner care about and how do they vary across the population?
  - What is the optimal policy and how can it be implemented?
- Findings:
  - Pecuniary + cost of credit externalities, strength varies with type.
  - Optimal policy can be implemented with individual-specific DSTI (PTI) limit.
- My take: optimal policy is a nice benchmark, but uses hyperspecific policies.
  - When you customize person-by-person, many limits are isomorphic.
  - Simple policies are more relevant and may have more interesting economics.

A Very Simple Model

- Consider borrower who chooses consumption (c_i), housing (h_i), and mortgage balance (m_i) to maximize

$$\max_{c_i, h_i, m_i} \underbrace{c_i}_{\text{consumption}} + \underbrace{\sum_{j=0}^{\infty} \beta^j \zeta_i \log h_i}_{\text{housing services}} - \underbrace{\sum_{j=1}^{\infty} \beta^j r m_i}_{\text{mortgage payments}}$$

subject to

$$\begin{aligned} \text{Budget Constraint}: \quad & c_i \leq \cdots + m_i - p h_i \\ \text{LTV Constraint}: \quad & m_i \leq \theta^{LTV} p h_i \\ \text{PTI Constraint}: \quad & r \cdot m_i \leq \theta^{PTI} y_i \end{aligned}$$

- Note: debt limits are not individual-specific.

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$$\max_{c_i, h_i, m_i} \underbrace{c_i}_{\text{consumption}} + \underbrace{\alpha_i^h \log h_i}_{\text{housing services}} - \underbrace{\alpha^m m_i}_{\text{mortgage payments}}$$

subject to

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- Note: debt limits are not individual-specific.

Equilibrium

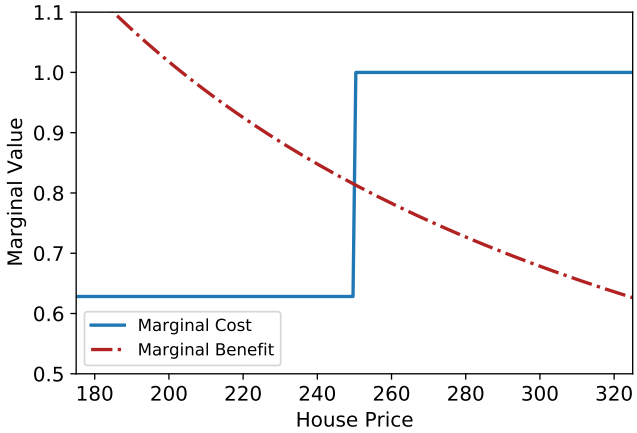
- First order conditions:

$$(h_i): \quad \alpha_i^h h_i^{-1} = (1 - \theta^{LTV}\mu_i^{LTV})p_t$$
$$(m_i): \quad (1 - \alpha^m) = \mu_i^{LTV} + \mu_i^{PTI} \equiv \mu$$

- Three regions depending on value-to-income ratio (α_i^h):
  1. Low α_i^h: constrained by LTV only, $\mu_i^{LTV} = \mu$.
  2. Medium α_i^h: constrained by **both**. Choose house price equal to max PTI loan plus minimum down payment. $0 < \mu_i^{LTV} < \mu$.
  3. High α_i^h: constrained by PTI only. $\mu_i^{LTV} = 0$.

Intuition

- Both constraints binding not a knife edge case.
- Marginal cost of financing jumps discontinuously as borrower switches from credit to cash.



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- Three regions depending on value-to-income ratio (α_i^h):

α_i^h	Binding Constraint	h_i	m_i
Low	LTV	$\alpha_i^h / \left[(1 - \theta^{LTV}\mu)p\right]$	$\theta^{LTV} p h_i$
Medium	Both	$\theta^{PTI} y_i / (r \cdot \theta^{LTV} \cdot p)$	$\theta^{PTI} y_i / r$
High	PTI	α_i^h / p	$\theta^{PTI} y_i / r$

Policy Experiments

- **Policy #1:** tax on borrowing. Equivalent to reduction in μ.
- Compute "first-round" effects on housing and mortgage demand (GE would adjust p).
- Result: only LTV-constrained affected, proportional reduction in housing and debt.
- Intuition: only LTV-constrained can use collateral at the margin.

α_i^h	Binding Constraint	$-\partial \log h_i / \partial \mu$	$-\partial \log m_i / \partial \mu$
Low	LTV	$-\theta^{LTV}/(1-\theta^{LTV}\mu)$	$-\theta^{LTV}/(1-\theta^{LTV}\mu)$
Medium	Both	0	0
High	PTI	0	0

Policy Experiments

- **Policy #2:** reduction in θ^{LTV}.
- LTV-constrained borrowers reduce housing demand, reduce debt even more.
  - θ^{LTV} affects both "LTV" and "V"
- Jointly constrained borrowers **increase** housing demand, do not adjust debt.
- Ambiguous effect on total housing demand (prices), decrease in debt.

α_i^h	Binding Constraint	$-\partial \log h_i / \partial \theta^{LTV}$	$-\partial \log m_i / \partial \theta^{LTV}$
Low	LTV	$-\mu/(1-\theta^{LTV}\mu)$	$-1-\mu/(1-\theta^{LTV}\mu)$
Medium	Both	1	0
High	PTI	0	0

Policy Experiments

- **Policy #3:** reduction in θ^{PTI}.
- Jointly constrained borrowers decrease housing demand and debt.
- PTI-constrained borrowers decrease debt but not house size.
  - Housing financed with cash at the margin, not affected by credit.
- Decline in housing demand, (slightly) larger decrease in debt.

α_i^h	Binding Constraint	$-\partial \log h_i / \partial \theta^{PTI}$	$-\partial \log m_i / \partial \theta^{PTI}$
Low	LTV	0	0
Medium	Both	-1	-1
High	PTI	0	-1

Takeaways and Suggestions

- Tax on borrowing **not equivalent** to change in PTI (or LTV) limit when policies are not individual-specific.
  - Differences in cross-sectional effects, could be important if externalities vary with type.
  - Differences in aggregate consequences for housing and credit demand.
- Constant policies map much more clearly into real-world macroprudential frameworks.
- Tractable in Ramsey economy?
- Important consideration: what characteristics are associated with constraints.
  - Work in progress: binding PTI appears to be combination of lower income and higher VTI ratios.

Conclusion

- Paper working toward important question: optimal policies for macroprudential housing instruments.
  - Planner would like to influence pecuniary and cost of debt externalities.
- Optimal tax on debt can be implemented using individual-specific PTI (DSTI) limits.
- May be substantial value added in moving away from individual-specific policies.
  - Breaks equivalence of policies.
  - Influences different parts of the population differently.
  - Changes link between house prices and debt.
- Very promising research area with room for many papers.