

# An Equilibrium Model of Housing and Mortgage Markets with State-Contingent Lending Contracts

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# Summary

- ▶ Main question: what is the equilibrium mortgage contract when payments can be state-dependent?
- ▶ Approach: GE model with endogenous house prices, housing supply, home-ownership. Features aggregate income risk, strategic + liquidity default.
  - Stylized framework + risk neutrality  $\implies$  closed-form solutions.
- ▶ Main findings:
  1. Unique equilibrium contract: Home Equity Insurance Mortgage (HEIM).
    - Mortgage fully indexed to house prices.
  2. In absence of strategic default, contract would index to wages to minimize liq. defaults.
  3. Misalignment of contract preferences among borrowers  $\implies$  potential instability.

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# Evaluation

- ▶ Elegant paper that uses strong assumptions to generate sharp results.
- ▶ May not want to take results completely literally.
  - Full house price insurance on mortgages may be extreme.
- ▶ But paper is full of valuable insights about mortgage design.
- ▶ Generalizing results implies that **standard mortgage** with **tail house price insurance** might be a great contract for the real world.

# Interpreting the HEIM Result

- ▶ Striking result: **unique** equilibrium contract is HEIM fully indexed to house prices.
- ▶ But this means that the equilibrium ownership arrangement is...renting?
- ▶ “Owners”:
  - Put zero money down at purchase.
  - On net, pay fixed amount in exchange for housing services.
  - Receive none of the gains and losses on the value of the property.
  - Move out if they can't afford to pay.
- ▶ If ownership is effectively identical to renting, should owners still get utility boost  $\theta_i$ ?

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# Beyond HEIMs

- ▶ This paper can still guide mortgage design even without full HEIMs.
- ▶ (Robust) foundation of HEIM result: can't have strategic default at equilibrium.
  - Lender takes losses when borrowers strategically default.
  - Can drop strategic defaulters by lowering payments in default states, raising in non-default states.
- ▶ Why **complete** insurance? **Zero** cost to ownership/default.
- ▶ Indifference condition for owning (ignore liquidity default for now)

$$\underbrace{0}_{\text{rent}} = \sum_s \pi_s \max \left\{ \underbrace{\theta + P_1(s) - m(s)}_{\text{keep}}, \underbrace{0}_{\text{default}} \right\}$$

- ▶ No strategic default  $\iff$  no variation in  $P_1(s) - m(s)$ .

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- ▶ Now, can have some variation in  $P_1(s) - m(s)$ , don't need full insurance.
- ▶ But still need to make sure  $\min_s \underline{\theta} + P_1(s) - m(s) \geq 0$ .
- ▶ Takeaway: mortgages should include **tail insurance**, approaching full insurance as default costs (down payment)  $\rightarrow 0$ .
- ▶ Note: "skin in the game" important no matter what your forecast of house prices is!

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# Liquidity Defaults

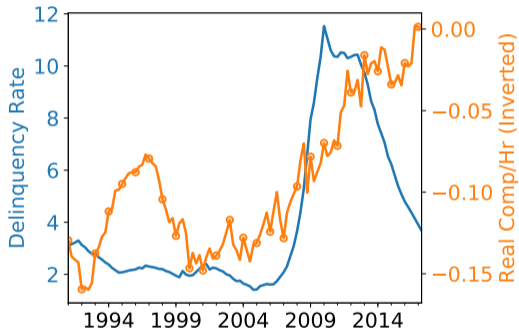
- ▶ With positive down payment/default cost, need tail insurance, but now have more flexibility on the rest of the contract. What should it look like?
  - P & T: minimize **liquidity default** by indexing to wages.
- ▶ Potential issue: liquidity default in the model if labor income  $w(s)l_i$  is less than the mortgage payment  $m(s)$ , **even if above water**.
- ▶ In practice, borrowers with negative liquidity shocks may be able to sell, or do a short sale. Keeping borrowers above water (e.g., HEIM or tail insurance) might largely fix this.
  - But underwater borrowers can't. Liquidity default = strategic default at specific threshold.
- ▶ Many liquidity defaults due to unemployment, effectiveness of indexing to wages unclear.

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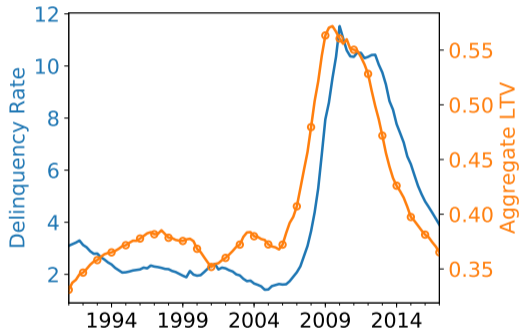
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# Liquidity Defaults

- ▶ Mortgage delinquencies not strongly correlated with real wages.



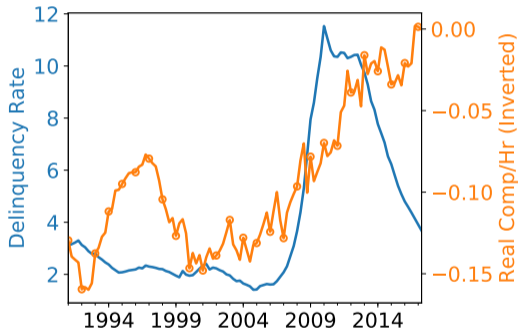
(a) Delinq. vs. Real Comp./Hr (Detrended)



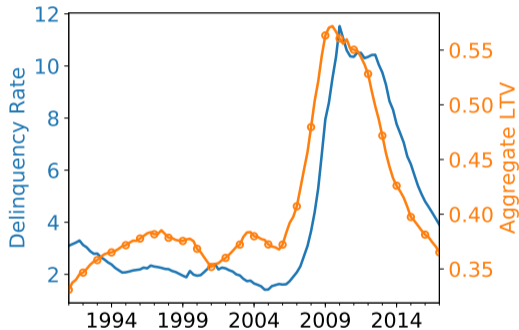
(b) Delinq. vs. Aggregate LTV

# Liquidity Defaults

- ▶ Aggregate leverage (proxy for probab. underwater) plus 4Q delay delivers near perfect fit.



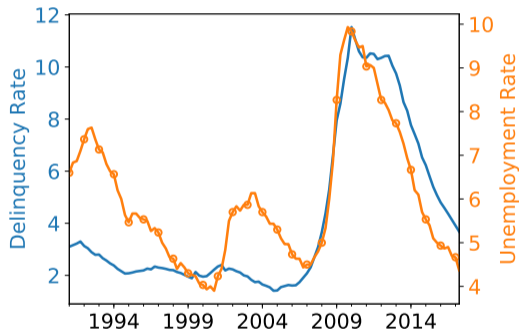
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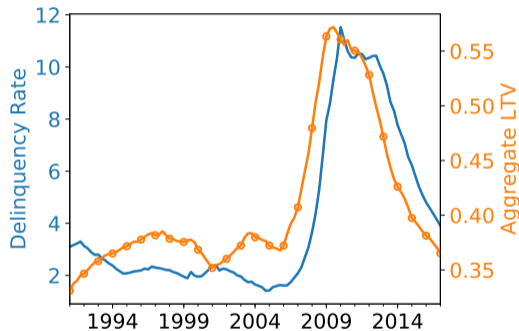
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# Liquidity Defaults

- ▶ Unemployment more correlated with delinquency, but only when leverage high.



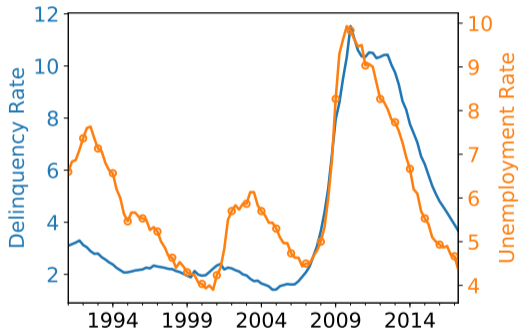
(a) Delinq. vs. Unemployment



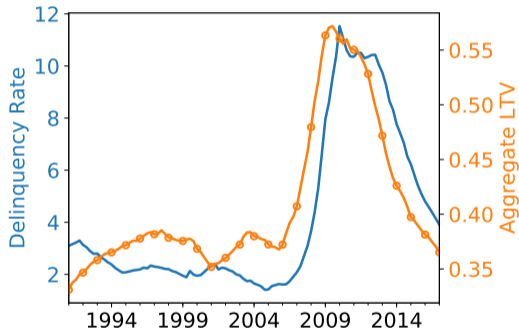
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# Liquidity Defaults

- ▶ Takeaway: keeping borrowers above water may be the most effective way to prevent liquidity defaults.



(a) Delinq. vs. Unemployment



(b) Delinq. vs. Aggregate LTV



# Liquidity Defaults

- ▶ On the other hand, liquidity defaults in the model could easily stand in for risk sharing.
  - Otherwise absent in the model due to risk neutrality.
  - Index payments to wages  $\implies$  consumption smoothing.
- ▶ Contract minimizing liq. defaults very similar to contract maximizing expected utility

$$\min_{m(s)} \sum_s \pi_s G \left( \frac{m(s)}{w(s)} \right) = \max_{m(s)} E \left[ -G \left( \frac{m(s)}{w(s)} \right) \right].$$

- ▶ But wages move much less than interest payments, benefits of **aggregate** wage insurance might be small (Lucas calculation).
- ▶ Takeaway: outside of strategic default region, standard mortgage contract may be okay!

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$$\min_{m(s)} \sum_s \pi_s G\left(\frac{m(s)}{w(s)}\right) = \max_{m(s)} E\left[-G\left(\frac{m(s)}{w(s)}\right)\right].$$

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# Instability

- ▶ P & T instability result: equilibrium may not exist at all.
- ▶ Key is tension between different types of borrowers:
  - Low ownership utility borrowers have highest value from default option, **dislike** full HEIM.
  - Medium ownership utility borrowers prefer low average payment, **like** full HEIM.
  - High ownership utility borrowers want to minimize liq. default risk, **dislike** full HEIM.
- ▶ All intuitive and relevant forces, existence depends on balance of groups.
- ▶ Standard mortgage with tail insurance might relieve tension, improve stability.
  - Low average payment without overinsurance in normal times.

# Conclusion

- ▶ Impressive paper full of important insights.
- ▶ Intuition is robust, even if results not taken literally.
- ▶ Standard mortgage contract with tail house price insurance worth considering!
- ▶ Related: Greenwald, Landvoigt, Van Nieuwerburgh (2017) study implications in model with levered intermediaries.
  - Agg. house price indexation increases financial fragility by destabilizing bank balance sheets.
  - Good reason not to provide full insurance when you don't need to.
  - But no equilibrium strategic default/tail insurance argument should still go through!