

Interest Rate Fluctuations and Equilibrium in the Housing Market

Discussant: Kartik Athreya, Richmond Fed

December 5, 2008

- General Question 1: Why Have House Prices Changed So Much? (esp—why did they go **up** so much?)
 - This is a **Macro** Problem
- General Question 2: Can an Equilibrium Asset Pricing Model Help Us Understand Prices?
 - This is a **Macro** Approach
- Specific Question: Did Low Interest Rates Cause the Run-up in House Prices?

- Author also wants to take on three observations



$$\sigma_{P_h}^2, \sigma_{vol}^2 > 0 \text{ "and big"}$$



$$\text{cov}(P_H, r) < 0$$



$$\text{cov}(P_h, Vol) > 0$$

Where Does this Paper Fit In?

- Policy
 - Ned Listed 4 Themes:
 - Broader Use of Credit
 - Change in Homeownership
 - Securitization
 - Price boom and bust

Where Does this Paper Fit In?

- Theory
 - GE models of Housing Dynamics
 - Kahn (Dec. 2008)
 - Garriga Schalgenauf (2008)
 - Hornstein (2008)

Households

- People participate in markets for two periods, sell house, then retire
- When young, must buy house (enter a mortgage contract)
- When older, might “want” to move—might need to sell the house and enter a new mortgage contract
- Moving is costly—don't always do it (owning risky)

Key Equations

- No Arbitrage

$$1 = \frac{D_t}{1+r_t} + (1-\pi_t) \frac{D_t}{1+r_t E(1+r_t)} + \pi_t \frac{1-D_t+d_t}{1+r_t}$$

- What's the (Constant) Mortgage Payment?

$$1 = \frac{D_t}{1+d_t} + \frac{D_t}{(1+d_t)^2}$$

Key Equations, Pt 2

- Old

$$V_{old}(\theta_h, h_{t-1}, s_{t-1}; P_{t-1}, H_{t-2}, H_{t-1}, r_{t-1}, r_t) = \max\{V_{move}, V_{stay}\}$$

- Old Movers:

$$V_{move} = \max\{U(c_{t,o,m}, h_{t,o,m}) + \beta E[U(c_{t,o,l}, 0)]\}$$

- Old Non-Movers

$$V_{stay} = \max\{U(c_{t,o,s}, h_{t,o,s}) + \beta E[U(c_{t,o,l}, 0)]\}$$

- Where

$$h_{t,o,s} = h_{t-1}$$

- and a KEY implication: **House Prices are Net Wealth**

$$c_{t,o,l} = P_{t+1} h_{t,o,m}$$

Key Equations, Pt 3

- What's the Old Mover's Budget Constraint?

$$\begin{aligned}
 c_{t,o,m} = & w_{old} + s_{t-1}(1 + r_{t-1}) \text{ [Wages + Savings]} - \\
 & \lambda P_t h_{t,o,m} \text{ [Down Payment]} + \\
 & \frac{(1 - \lambda) P_t h_{t,o,m} (1 + r_t)}{1 + r_t} \text{ [Mortgage]} + \\
 & [P_t h_{t-1} - (1 - \lambda) P_{t-1} h_{t-1} (1 - D_{t-1} + d_{t-1})] \text{ [Equity]} - \\
 & \dots \Delta \text{ [Realtors!!]}
 \end{aligned}$$

Key Equations, Pt 4

- What's the Old Non-Mover's Budget Constraint?

$$C_{t,o,s} = w_{old} + s_{t-1}(1 + r_{t-1}) [\text{Wages + Savings}] - \frac{(1 - \lambda)P_t h_{t-1}(1 + r_t)}{1 + r_t} [\text{Remaining Mortgage}]$$

- Get Bands of Inaction [S,s] because of Fixed Costs

$$\theta_{low}(s_{t-1}, h_{t-1}, P_{t-1}, H_{t-2}, H_{t-1}, r_{t-1}, r_t)$$

$$\theta_{high}(s_{t-1}, h_{t-1}, P_{t-1}, H_{t-2}, H_{t-1}, r_{t-1}, r_t)$$

Key Equations, Pt 5

- What's the Young Person's Value Function?

$$\begin{aligned}
 V_{young}(P_{t-1}, H_{t-2}, H_{t-1}, r_{t-1}, r_t) = & \max \int_{\theta_{\min}}^{\theta_{low}} V_{move} f(\theta) d\theta + \\
 & \underbrace{\int_{\theta_{low}}^{\theta_{high}} V_{stay} f(\theta) d\theta}_{\text{Inaction}} + \\
 & \int_{\theta_{high}}^{\theta_{max}} V_{move} f(\theta) d\theta
 \end{aligned}$$

- What's the Young Person's Budget Constraint?

$$c_{t,y} = w_{young} - s_{t,y} - \lambda P_t h_{t,y} - \frac{(1 - \lambda) P_t h_{t,y} D_t}{1 + r_t} - \Delta$$

Market Clearing

- Key Point: Housing Supply is Exogenous
- All Houses are Owned

$$\bar{H}_{tot} = \sum_{i=0}^1 \bar{H}_{t-i}$$

- Market Clears

$$\bar{H}_{t-2} + \bar{H}_{t-1} = H_{t,o,s} + H_{t,o,m} + H_{t,y}$$

Measuring Housing Purchases

- **All** the (identical) young

$$H_{t,y} = \int_0^1 h_{t,y}(i) di$$

- Old Stayers

$$H_{t,o,s} = \int_{\theta_{low}}^{\theta_{high}} h_{t-1} f(\theta) d\theta$$

- Old movers

$$H_{t,o,m} = \int_{\theta_{min}}^{\theta_{low}} h_{t,o,m} f(\theta) d\theta + \beta \int_{\theta_{high}}^{\theta_{max}} h_{t,o,m} f(\theta) d\theta$$

What's to Like?

- Many conversations start with “House Prices Grew/Fell and then....”
 - But: **Price Processes are part of the fixed point** that defines an equilibrium
 - In most variants of the growth models we use:
 - no shocks—converge to a steady state where suitably normalized variables do NOT fluctuate
 - So, you need Shocks and Endogenous Prices—Model has BOTH
 - Allows us to root (non-bubble) explanations in changes to (more) exogenous factors.

What's to Like?

- Complements (Allows) for the interpretation of more descriptive work
- Model is in GE–Well, *Partial* General Equilibrium
 - Housing market is cleared, given a path for the intertemporal price of consumption
- Author Gives us real **equilibrium** dynamics, not impulse-responses-to-surprises.

What's to Like?

- Allows us to (start to) confront a popular narrative—The Fed Did it!
- We heard from Paul Willen yesterday that a failure to place appropriate mass on house price declines was a proximate cause.
 - YA's paper gives us one reason that this may be tough—predicting house prices involves (in part) forecasting interest rates.
 - Asset Prices are supposed to be Martingales (dividend- and risk-adjusted).
- Model allows for feedback from interest to both house prices and non-housing consumption.
 - elasticity of substitution between housing and non-housing cons seems key
 - Gets Price-Volume Correlation without liquidity constraints

Why Worry?

- Housing Supply is Exogenous
 - Residential Investment relative to GDP hit a 50 year high just prior to the bust.
 - places with highest appreciation seemed to be places with tons of building
 - Las Vegas, Phoenix, Central Fla, the Inland Empire, ex-urbs of DC
 - Model probably getting too far much action from interest rates

Why Worry?

- No Extensive Margin for Homeownership rate among previously marginalized groups
 - a defining feature of the past decade.
 - Young homeownership rate always 100 percent.
 - all young do the same things
- I think that young would want fairly priced ARMs here
 - Author argues that he did it, and doesn't matter—surprising (and interesting)—more intuition for this
- No Rental Market
- All Young Buying+No Rental+Homogeneity—No speculative motive for young to buy

Why Worry?

- Not Clear What θ Can or Does Represent
 - Not directly observable
 - Cannot be income prospects, but:
 - Has to be purely idiosyncratic, else it would show up in \mathcal{I}_t
 - Yet, in the model, a major reason for real-estate transactions is θ .
- Why not use wage-risk in model, instead?
 - More standard measures are available
 - More discipline

Why Worry?

- Not as GE as you'd (ideally) want
 - Interest rates are exogenous.
 - If we get drop this, I'm not sure we'd reach the same answers
 - For example, good productivity shock hits
 - Can make Wages, Real Rates, Housing all rise

Why Worry?

- Agents care very little about descendants/replacements (i.e. not at all)
- implications for joint evolution of cons and house prices are probably overstated as a result.
- I'd like the author to have a more serious intergenerational link

Why Worry?

- Why Not Standard CRRA preferences? If you're computing, why worry about the closed form?
- Comparison with the Facts
 - Comovement of Prices and Volume (Fig 5 in the paper) look small-and only strongly positive in the recent 1997-2004 period.
- Story Works for the Run-up, But what about the fall?

- **Very Nice** Step in Taking a Macro Approach to a Macro Problem
- More Stylized, and Less GE than Ideal given the Quant Nature of the exercise
- Look forward to seeing future versions of the paper.