Joint Dynamics of House Prices and Foreclosures

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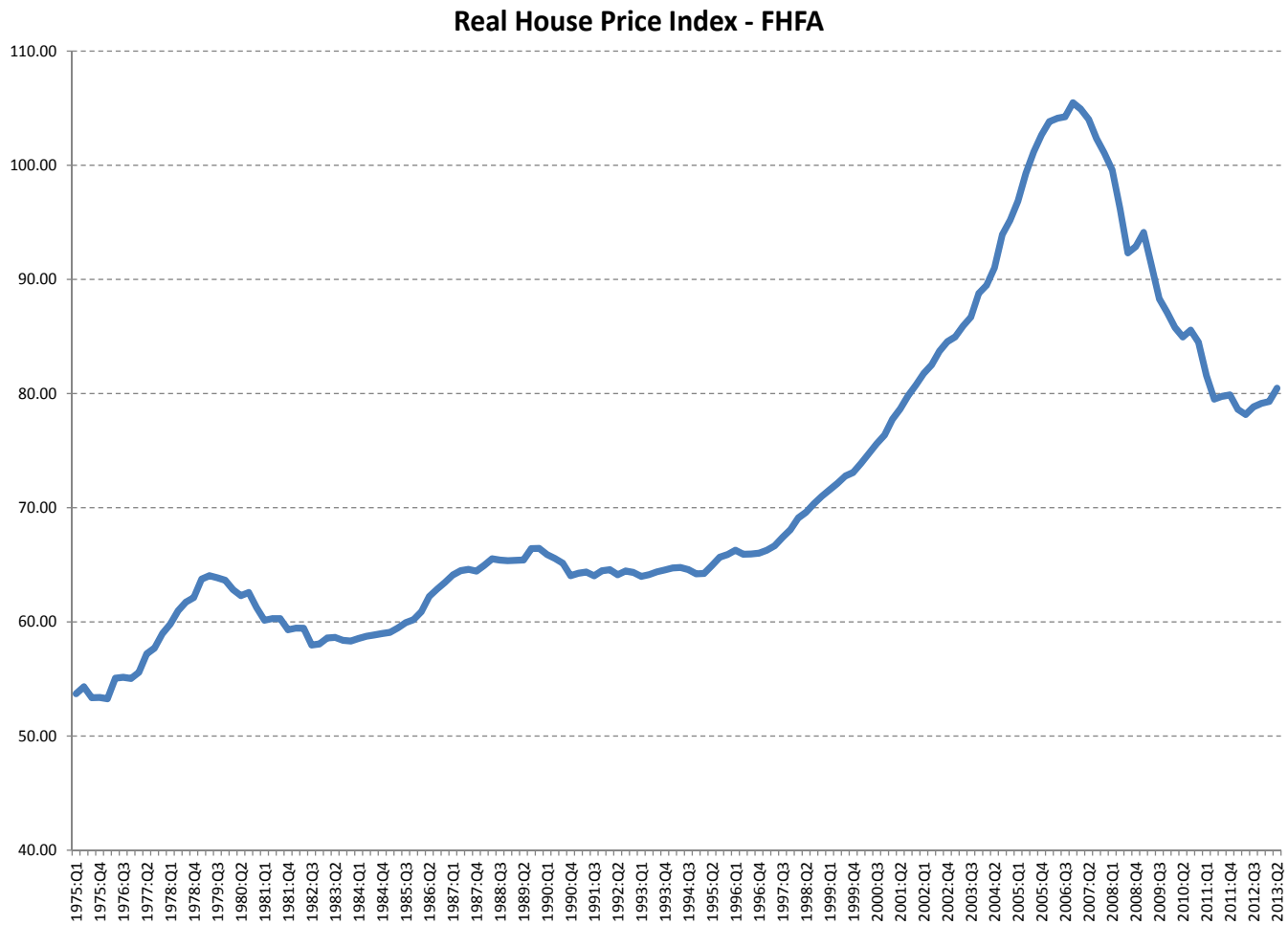
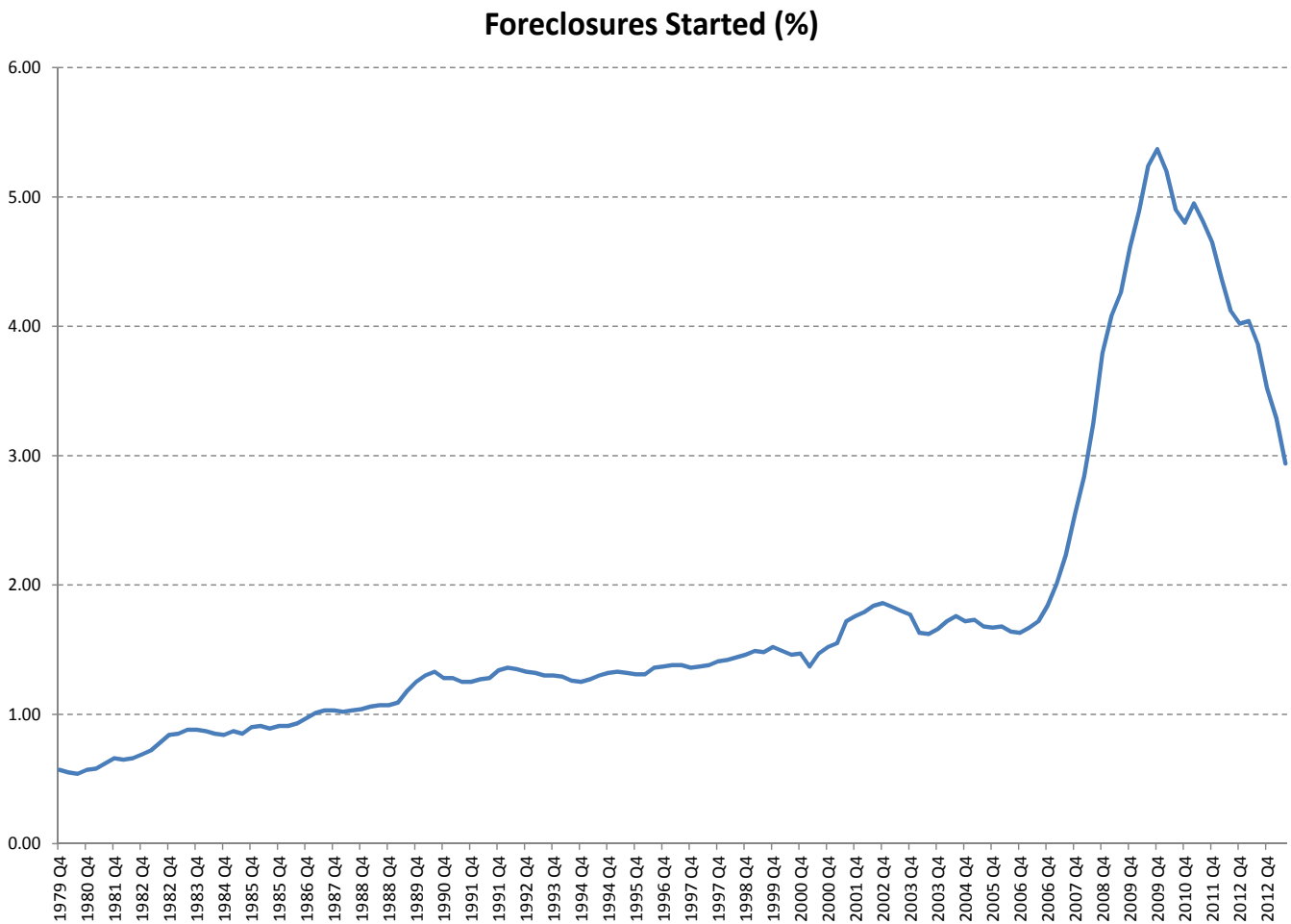
Real House Price Index - FHFA



Foreclosures Started



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  - Macroprudential Policy: Tighter credit constraints

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  - Bajari et al (2010), Foote et al (2008,2012), Mayer et al (2009), Mian and Sufi (2011)

Environment

- Life-cycle model with deterministic time horizon
- Utility from both consumption good and housing
- They either rent or own a house
- Households are subject to idiosyncratic income shocks
- Households are subject to moving shocks
- Purchase of a house can be done through a mortgage

Environment (cont.)

- Perfect competition among risk-neutral lenders
- Mortgage holders can default on the mortgage
- Terms of mortgage contracts are endogenous (downpayment and mortgage interest rate)
- Only fixed-rate mortgages (FRM) and maturity is determined by the age of the individual (but allow for prepayment)
- Selling a house is entitled to an idiosyncratic capital gain/loss
- Fixed house supply

Environment (cont.)

- Fixed house size and no explicit refinancing (but allow for implicit refinancing)
- No unsecured borrowing

Value Functions

- Four possible housing status: inactive renter, active renter, owner and mover

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  - Mover: Can sell the house or default on the mortgage (if any): $V^m = \max\left\{V^{hr}, V^{hd}\right\}$

Purchaser's Problem

$$V_j^{rh}(a,z) = \max_{c,a'} \left\{ u_h(c) + \beta E\left[(1-\psi) V_{j+1}^h\left(a', z'; r^m\right) + \psi V_{j+1}^m\left(a', z'\right) \right] \right\}$$

$$\begin{aligned} c + qa' + p^h &= y(z,j) + a \\ q &= \left\{ \begin{array}{ll} \frac{1}{1+r} & \text{if } a' \geq 0 \\ \frac{r^m}{1-(1+r^m)^{-M}} & \text{if } a' < 0 \end{array} \right\} \\ a' &\in \Psi\left(\tilde{a}, r^m; a, z, j\right) \text{ with } \tilde{a} \geq -p^h(1-\phi) \end{aligned}$$

Seller's and Defaulter's Problem

- Seller's Problem:

$$V_j^{hr}(a, z; \kappa) = \max_{c, a'} \left\{ u_r(c) + \beta E V_{j+1}^r(a', z') \right\}$$

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- Necessary condition for default: $a + p^h (1 - \varphi_h)(1 + \kappa_{\min}) \leq 0$

Lender's Problem

- Expected continuation value of the mortgage contract:

$$V_j^l\left(a,z,r^m\right)=\left\{\begin{array}{cc} a & \text{if hh sells} \\ p^h\left(1-\varphi_l\right) & \text{if hh defaults} \\ \frac{a'}{1+r^m}-a+\frac{1}{1+r}EV_{j+1}^l\left(a',z',r^m\right) & \text{if hh stays} \end{array}\right\}$$

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- At the time of origination we need to have (which pins down r^m):

$$V_j^l(a,z,r^m) = -a$$

Functional Forms

- Preferences:

$$\begin{aligned} u_r(c) &= \frac{c^{1-\sigma}}{1-\sigma} \\ u_h(c) &= u_r(c(1+\gamma)) \end{aligned}$$

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- Income process:

$$\begin{aligned} y(z,j) &= \exp(f(j)+z) \\ z' &= \rho z + \varepsilon \end{aligned}$$

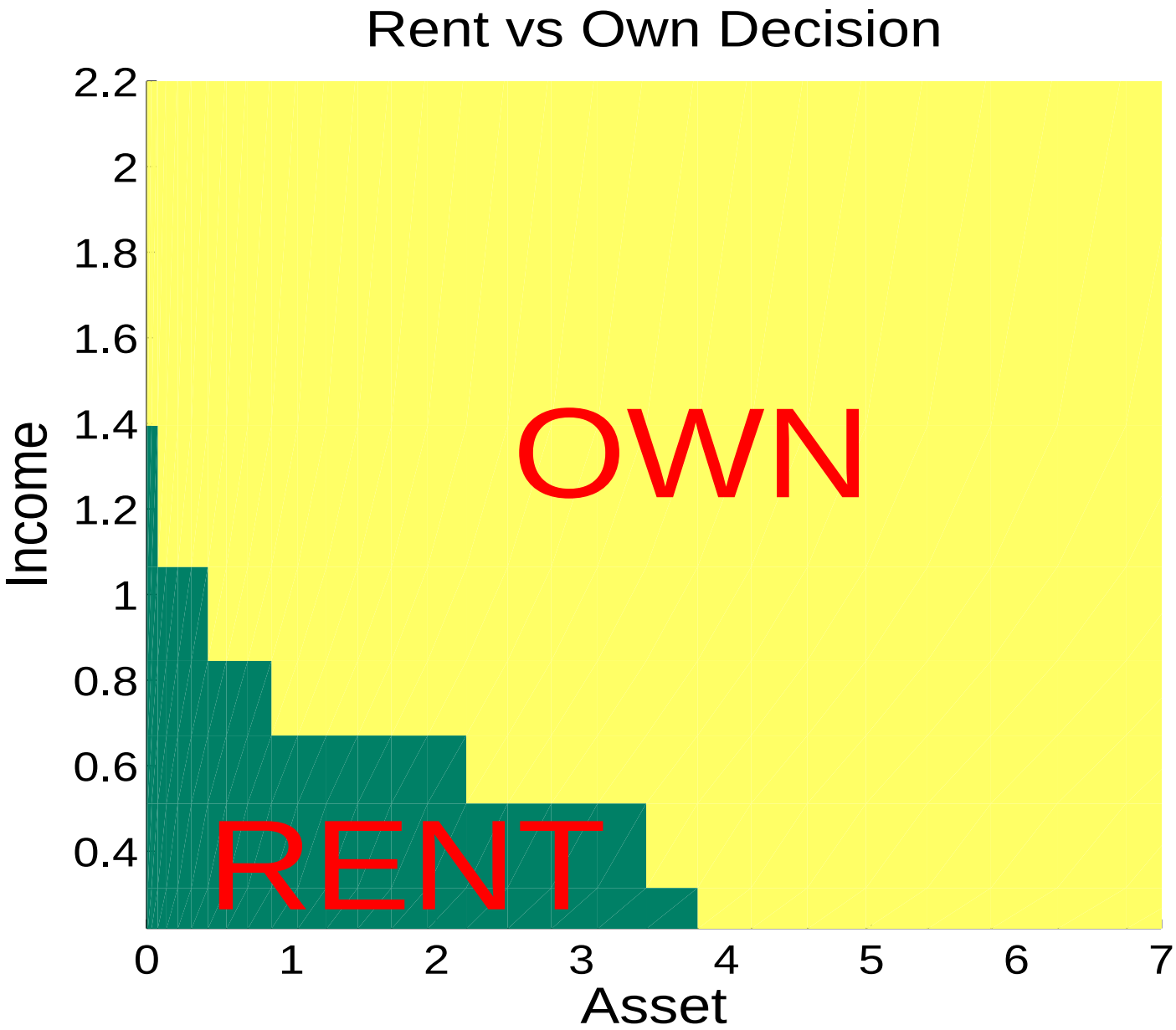
Parameters

Parameter	Explanation	Value
σ	risk aversion	2
ρ	persistence of income	0.84
σ_ε	std of innovation to AR(1)	0.34
φ_h	selling cost for a household	10%
r	risk-free interest rate - initial	2%
δ	prob. of being an active renter	0.14
u	unemployment shock	0.05
β	discount factor	0.95
φ_l	selling cost for a lender	10.7%
γ_h/γ_r	utility advantage of ownership	1.37
ψ	moving probability	4%

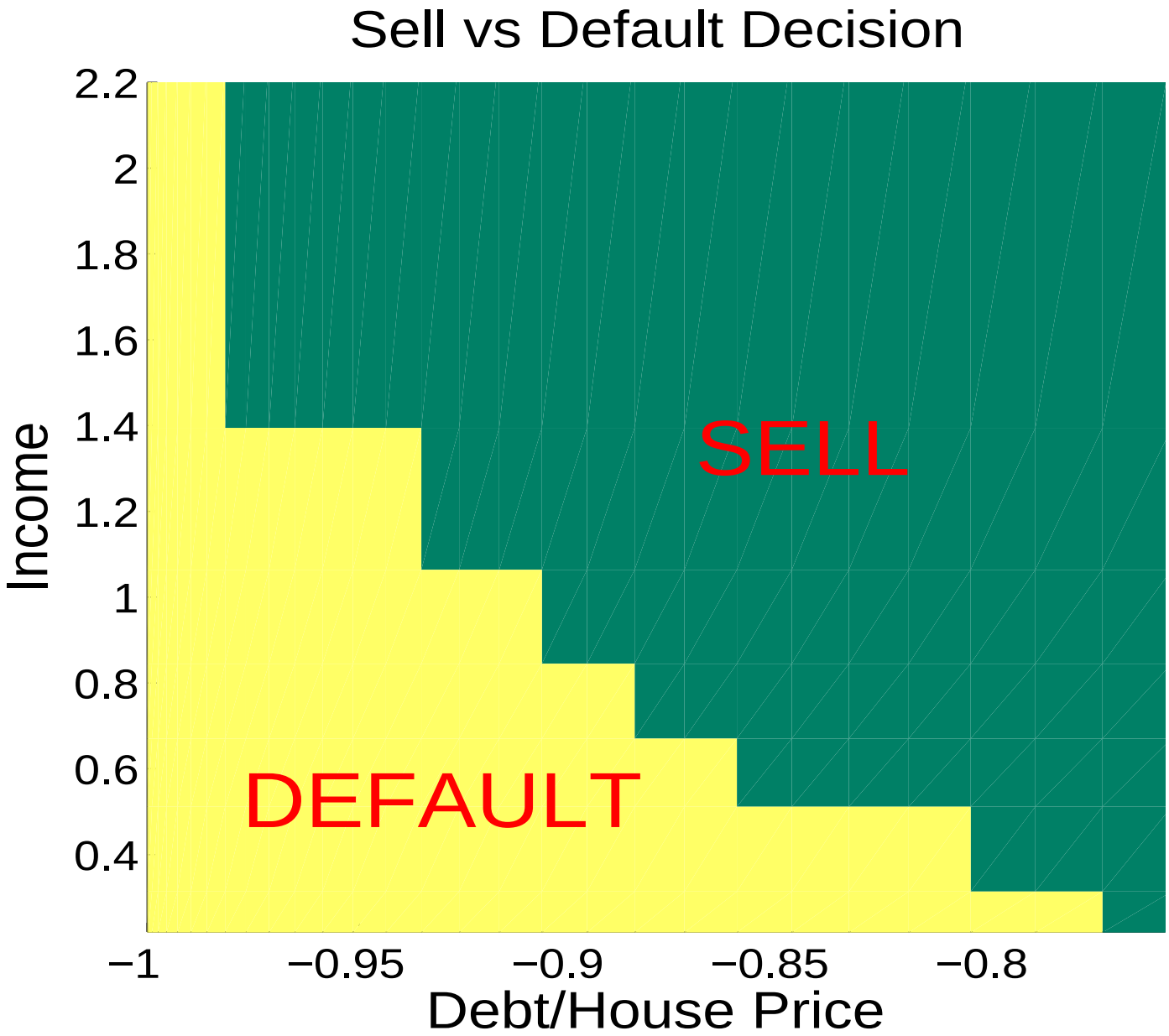
Steady State Analysis

Statistic	**Data**	**Model: r=2%**
Homeownership rate	68.8%	68.8%
Wealth-income ratio	4	4.1
Moving rate-owners	6.5%	6.3%
Foreclosure rate	1.7%	1.7%
Price to income ratio	3.0	3.0
Average down payment ratio	21.1	25.5%
Loan-to-Value ratio	58.4	53.3%

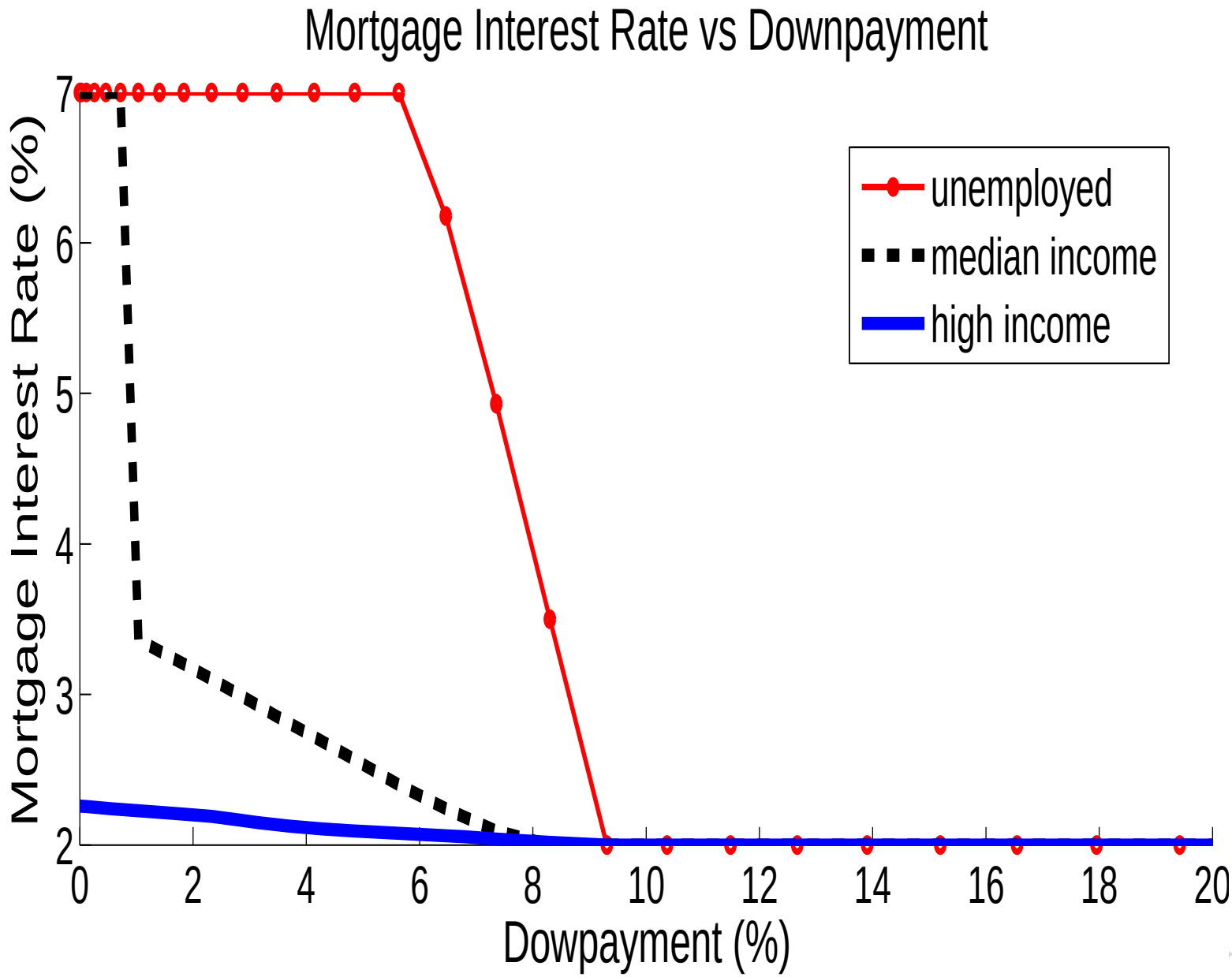
Who are the Purchasers?



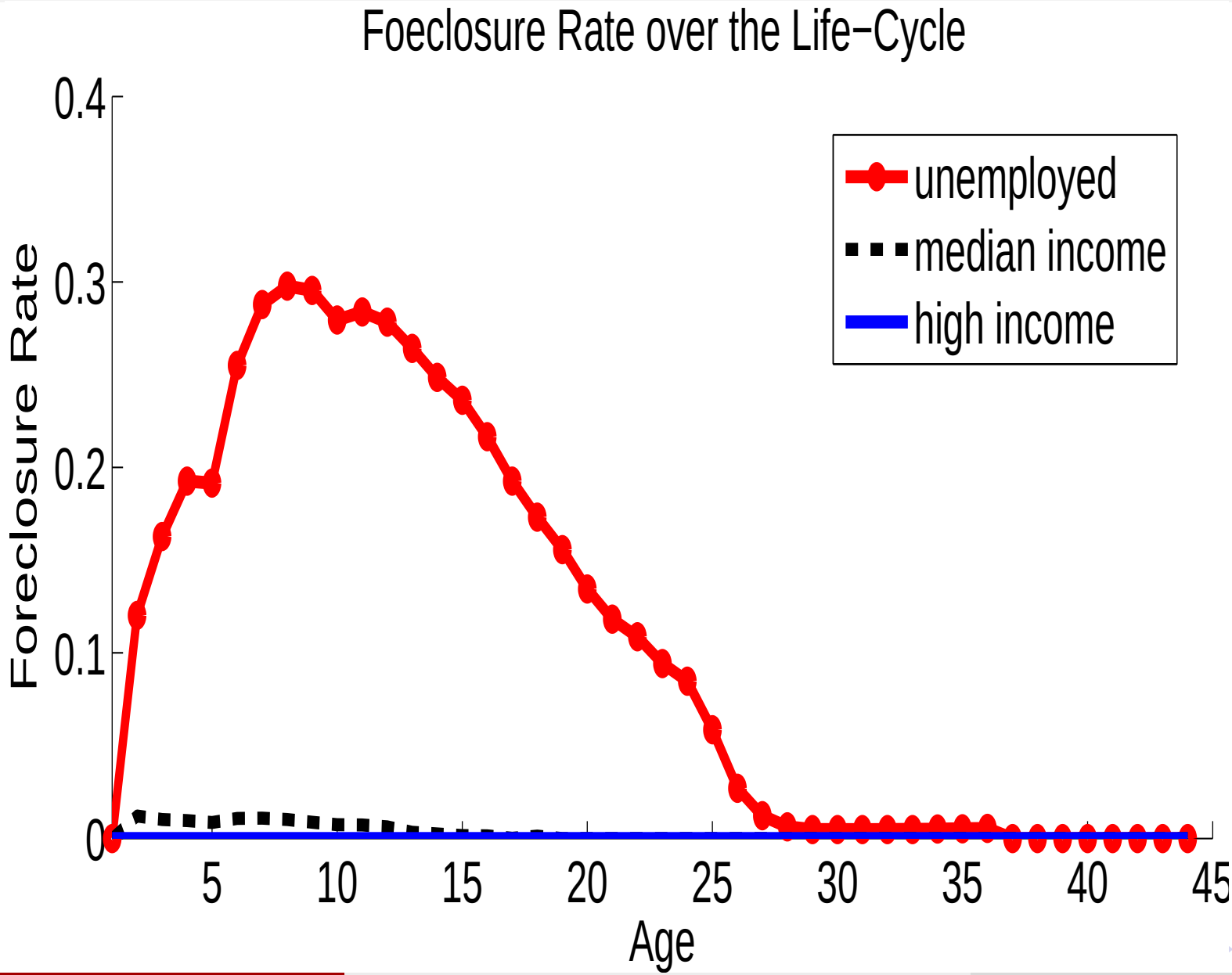
Who are the Sellers and Defaulters?



Mortgage Rate as a Function of Downpayment



Foreclosure Dynamics



Quantitative Exercise

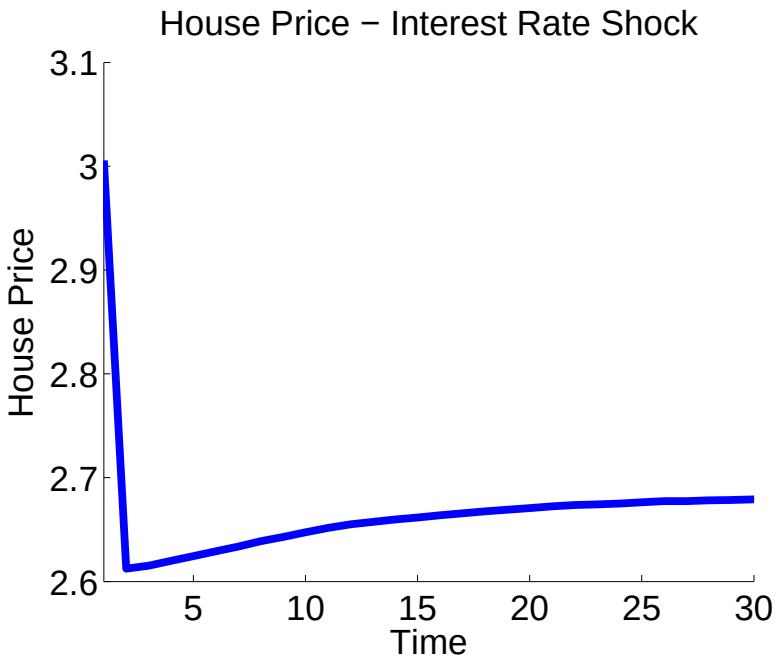
- We consider three unexpected shocks:
  - Higher risk free interest rate (an increase from 2% to 3%)
  - Tighter credit constraints (minimum down payment increases from 0% to 20%)
  - Higher unemployment rate (an increase from 5% to 6.5%)
- We analyze both steady-state and transitional dynamics

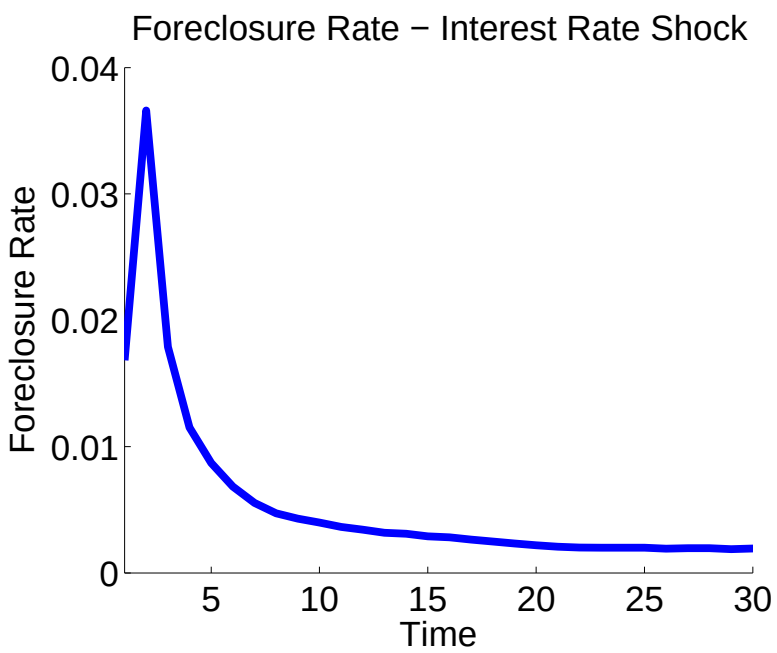
Steady State Comparison

	SS1	SS2	SS3	SS4	SS5
	r=2% λ**=0%**	**r=3%** λ**=0%**	**r=2%** λ**=20%**	**r=2%** λ**=0%**	**r=3%** λ**=20%**
Statistic	**u=5%**	**u=5%**	**u=5%**	**u=6.5%**	**u=6.5%**
Homeownership rate	68.8%	68.8%	68.8%	68.8%	68.8%
Price to income ratio	3.0	2.68	2.80	2.82	2.51
Foreclosure rate	1.7%	0.2%	0%	1.2%	0%
Down payment ratio	25.5%	33%	33%	27.5%	35.4%
Mortgage Premium	0.1%	0.001%	0%	0.03%	0%

Transitional Dynamics - Interest Rate Shock

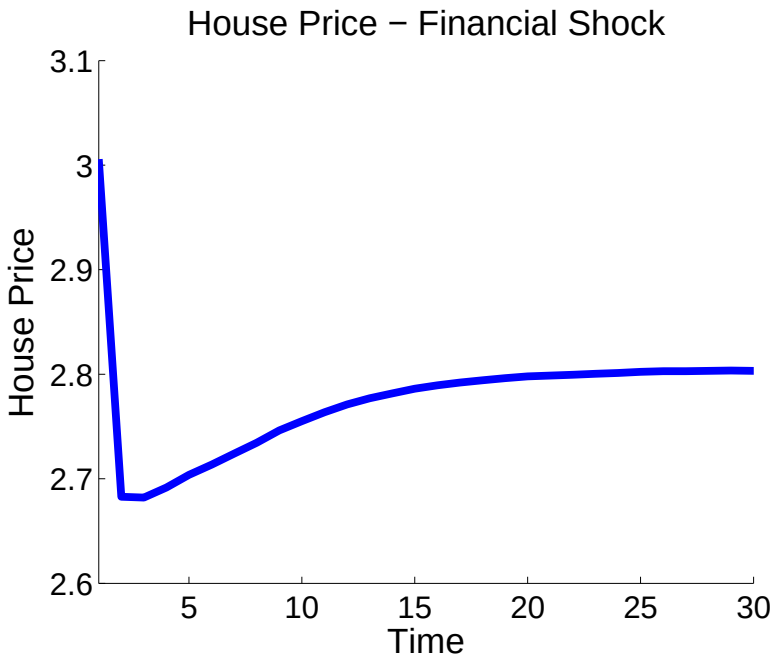
- Only risk free interest rate shock (an increase from 2% to 3%)

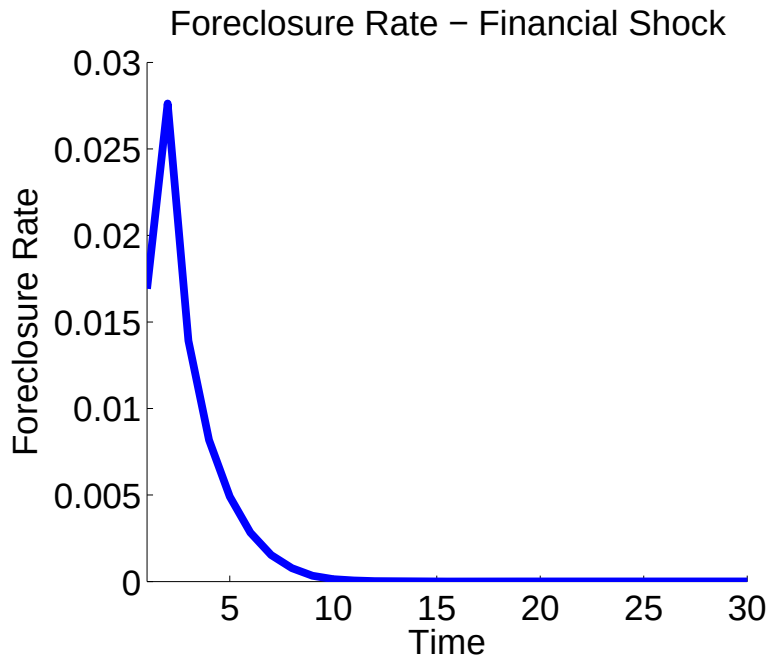




Transitional Dynamics - Financial Shock

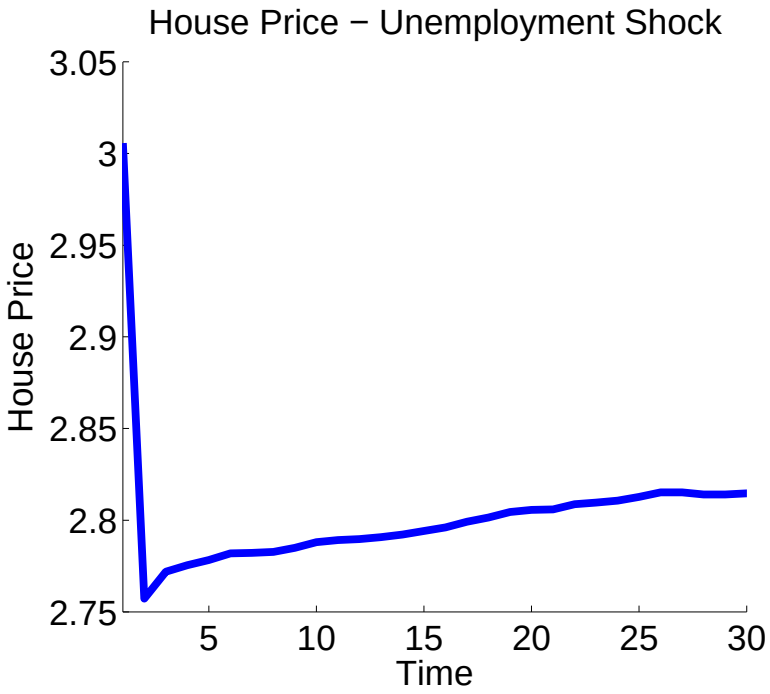
- Only financial shock (min down payment increases from 0% to 20%)

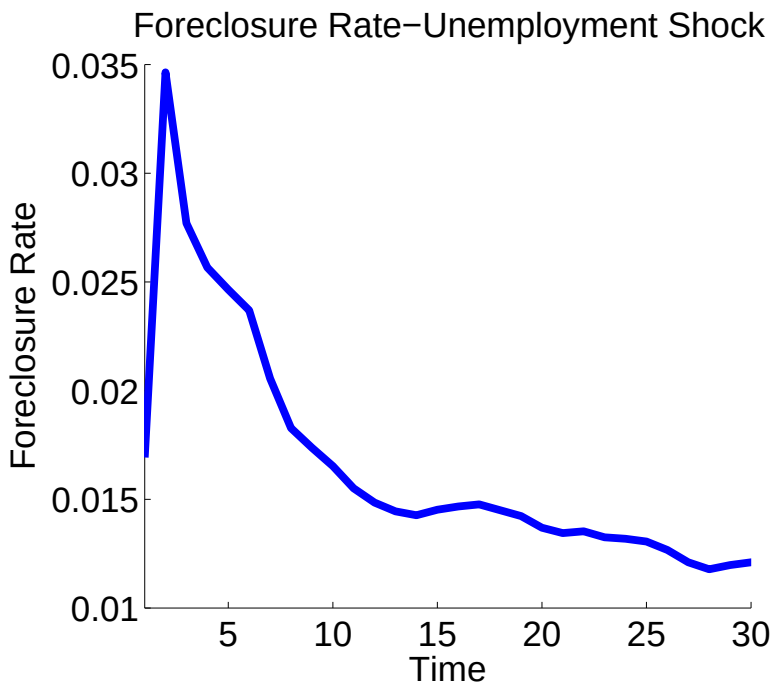




Transitional Dynamics - Unemployment Shock

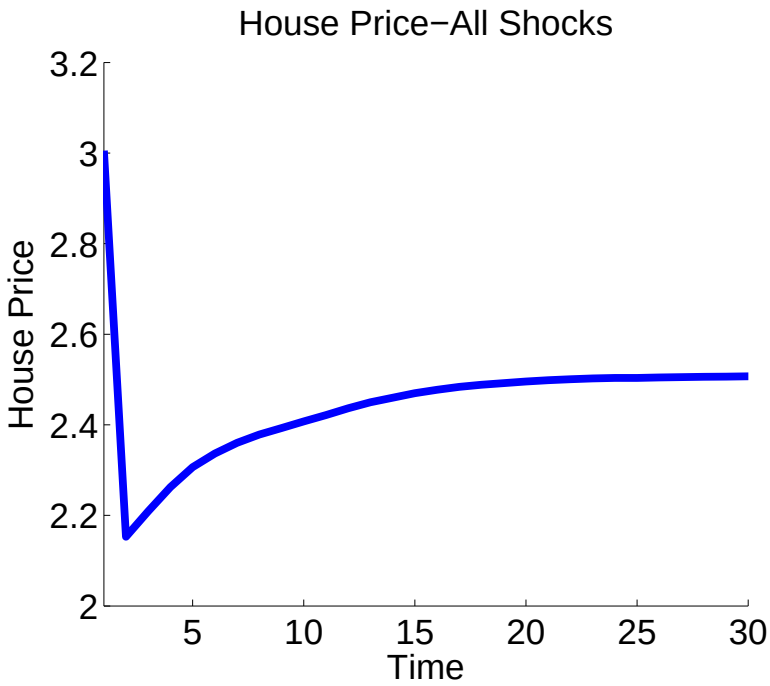
- Only unemployment shock (an increase from 5% to 6.5%)

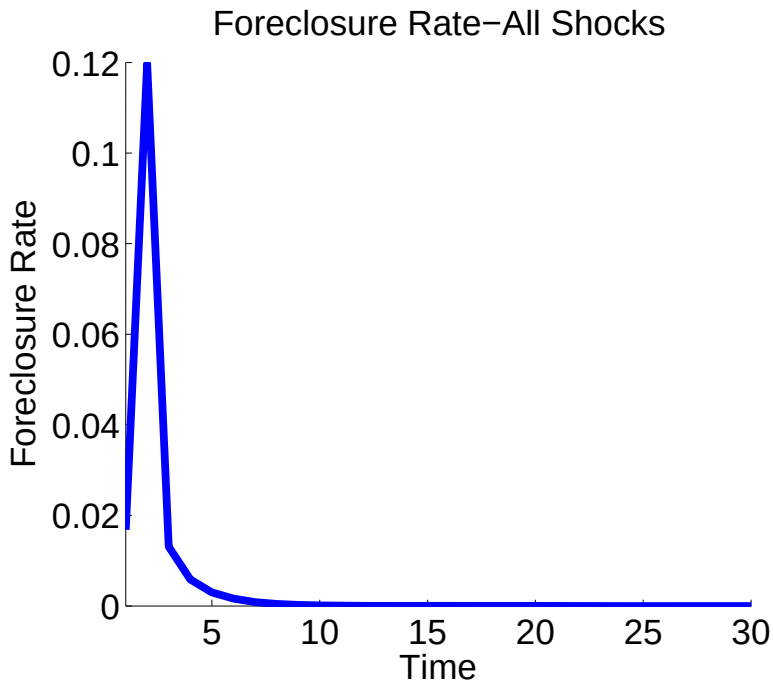




Transitional Dynamics - All Three Shocks

- All three shocks together





Transitional Dynamics - Comparison

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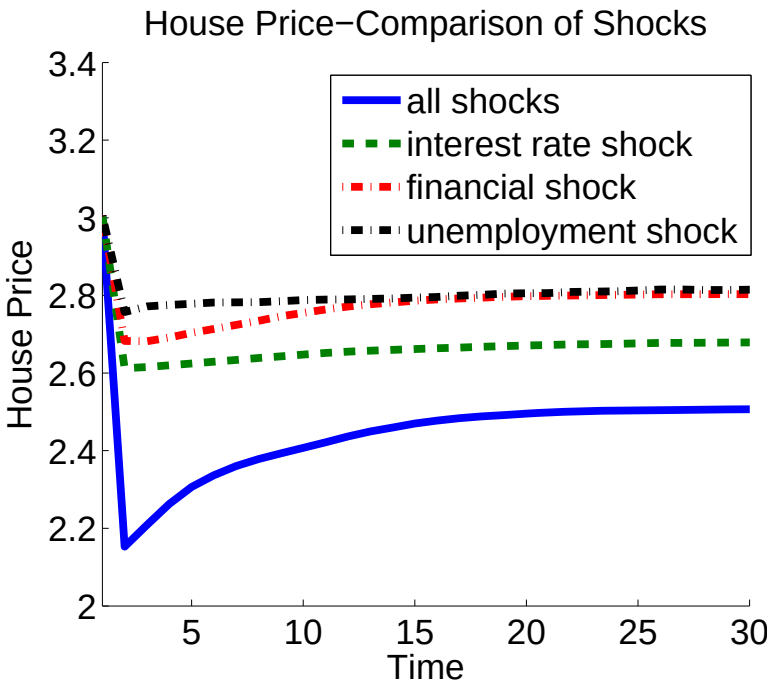
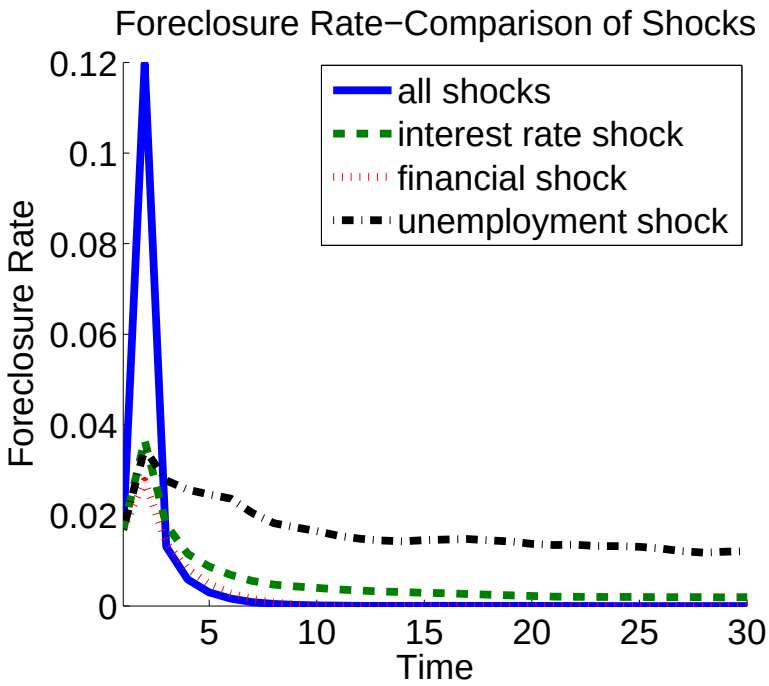
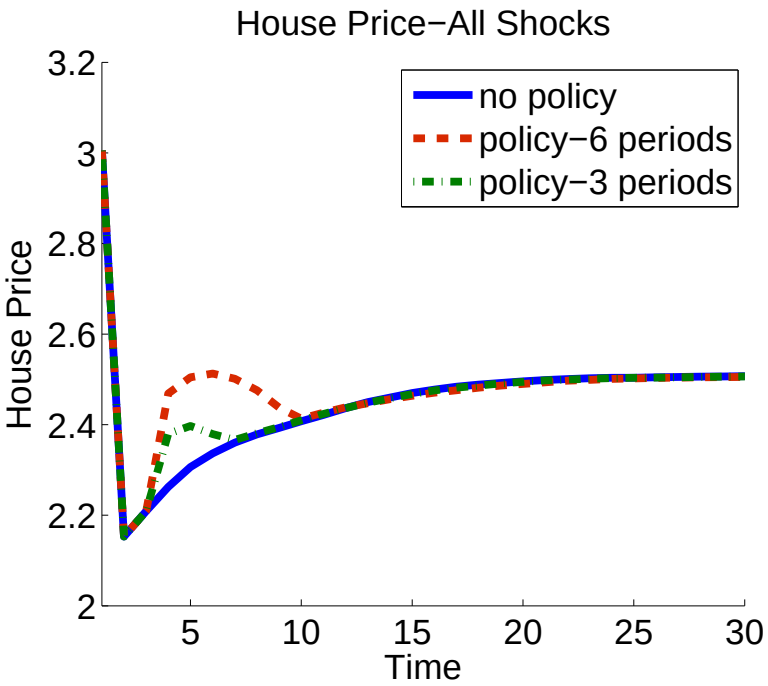
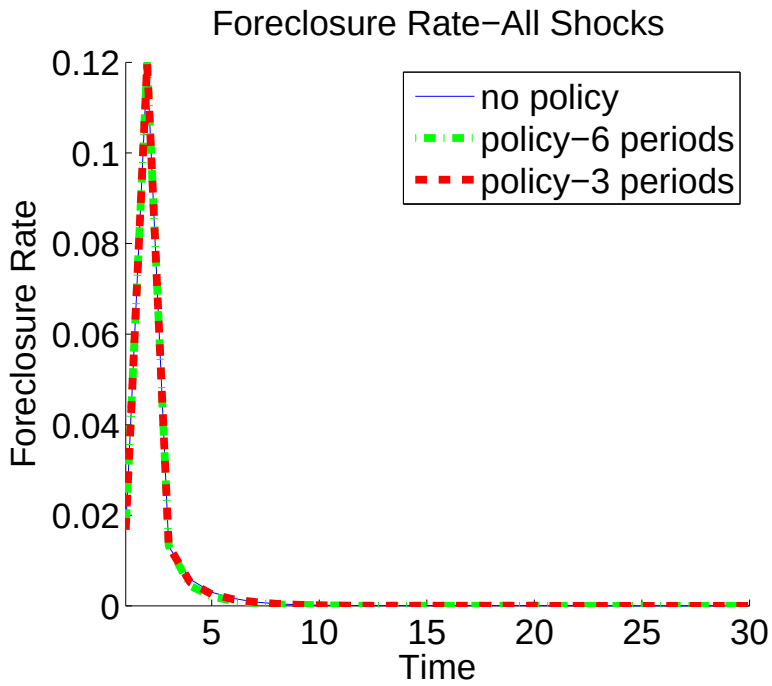




Monetary Policy

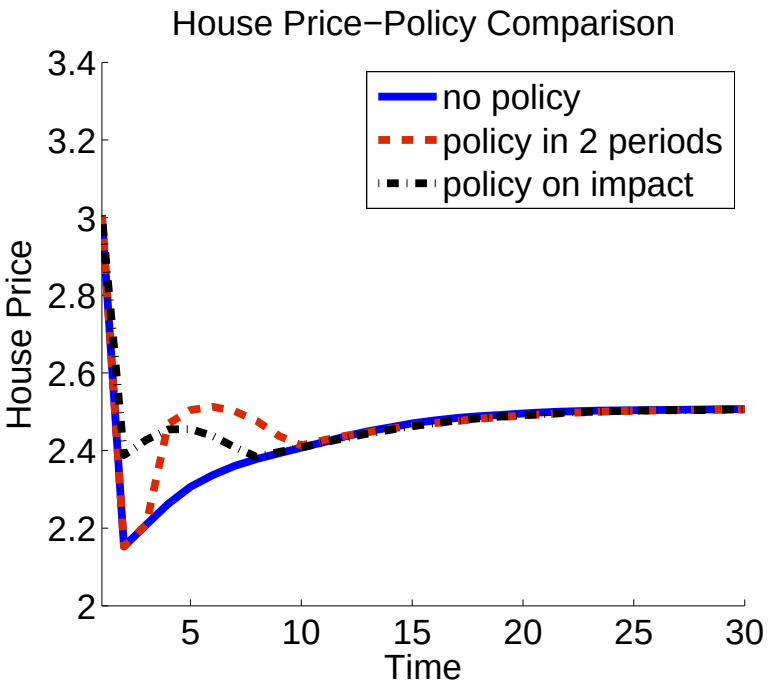
- FED lowers the interest rate two periods after the shocks to 0.5% and commits to this policy for a certain period of time.

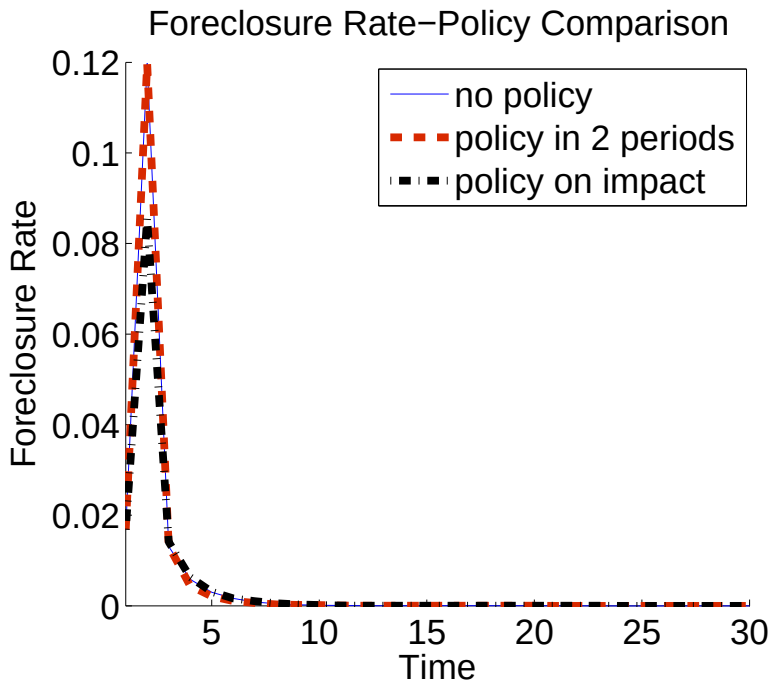




Timing of Monetary Policy

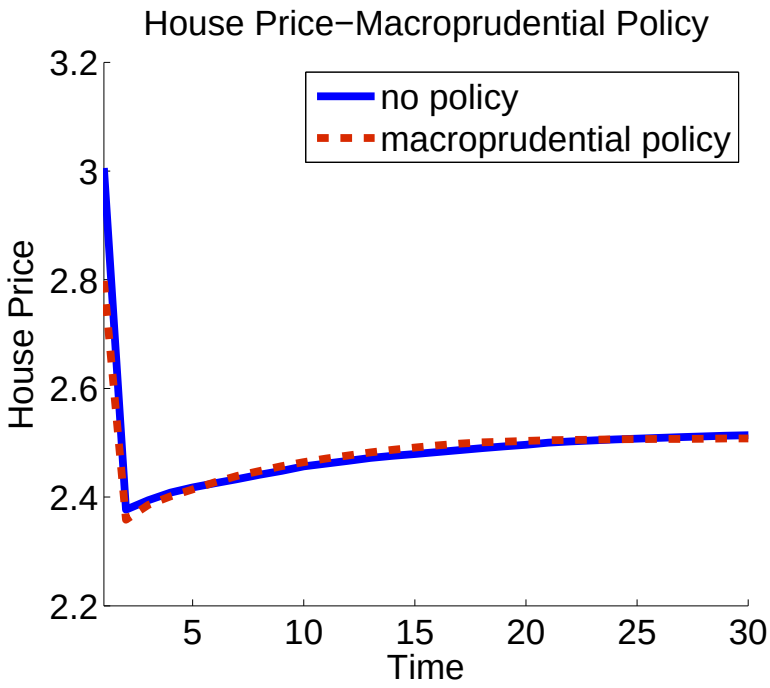
- FED lowers the interest rate on impact of the shocks to 0.5% and commits to this policy for 6 periods.

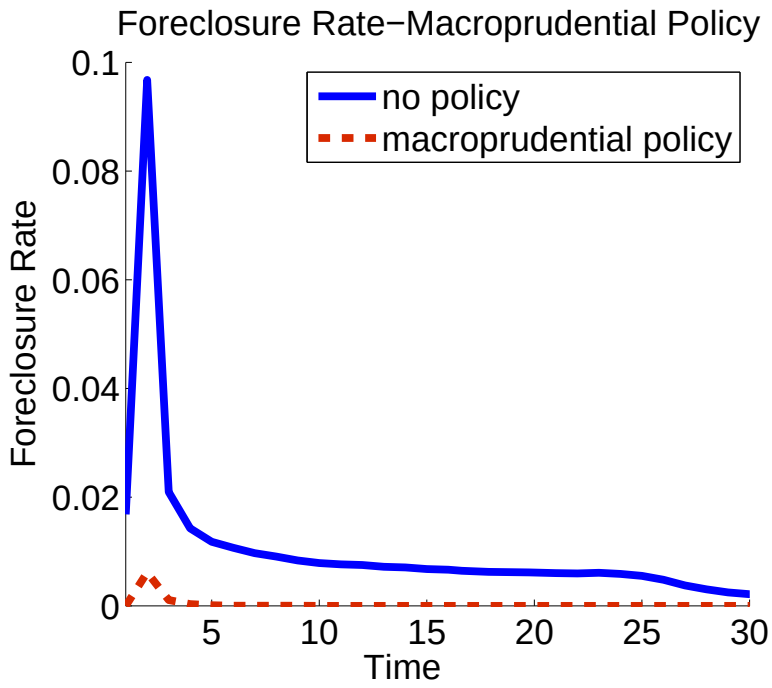




Macroprudential Policy

- Ex-ante macroprudential policy: Minimum down payment requirement is set to 20%.





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- The transition analysis is important to understand the foreclosure and price dynamics
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- Tighter credit constraints would result a less volatility in the housing market
- Need to do welfare analysis