The Macroeconomic Effects of Housing Wealth, Housing Finance, and Limited Risk Sharing in General Equilibrium

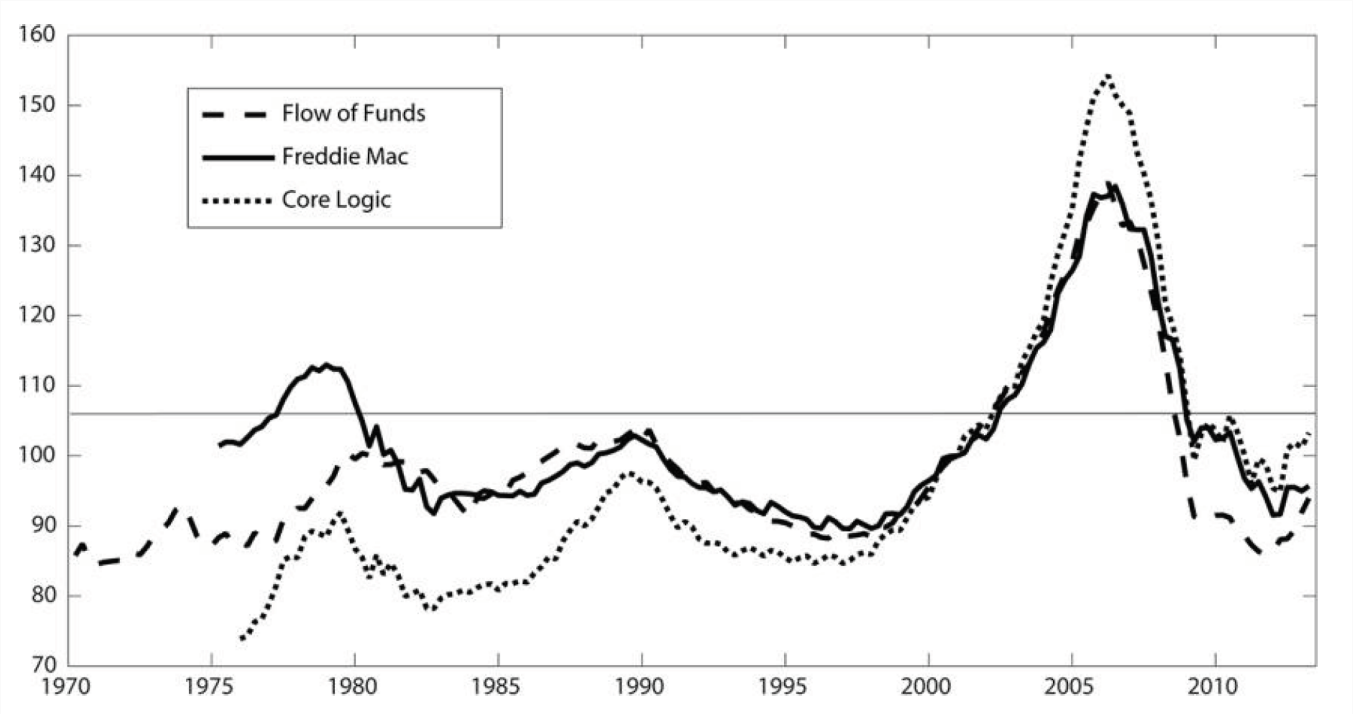
Jack Favilukis, Sydney Ludvigson & Stijn Van Nieuwerburgh

Motivation

What do we know from the build-up to the great recession?

1. Historically unprecedented increase in house prices relative to fundamentals

Boom and bust in US house prices relative to fundamentals



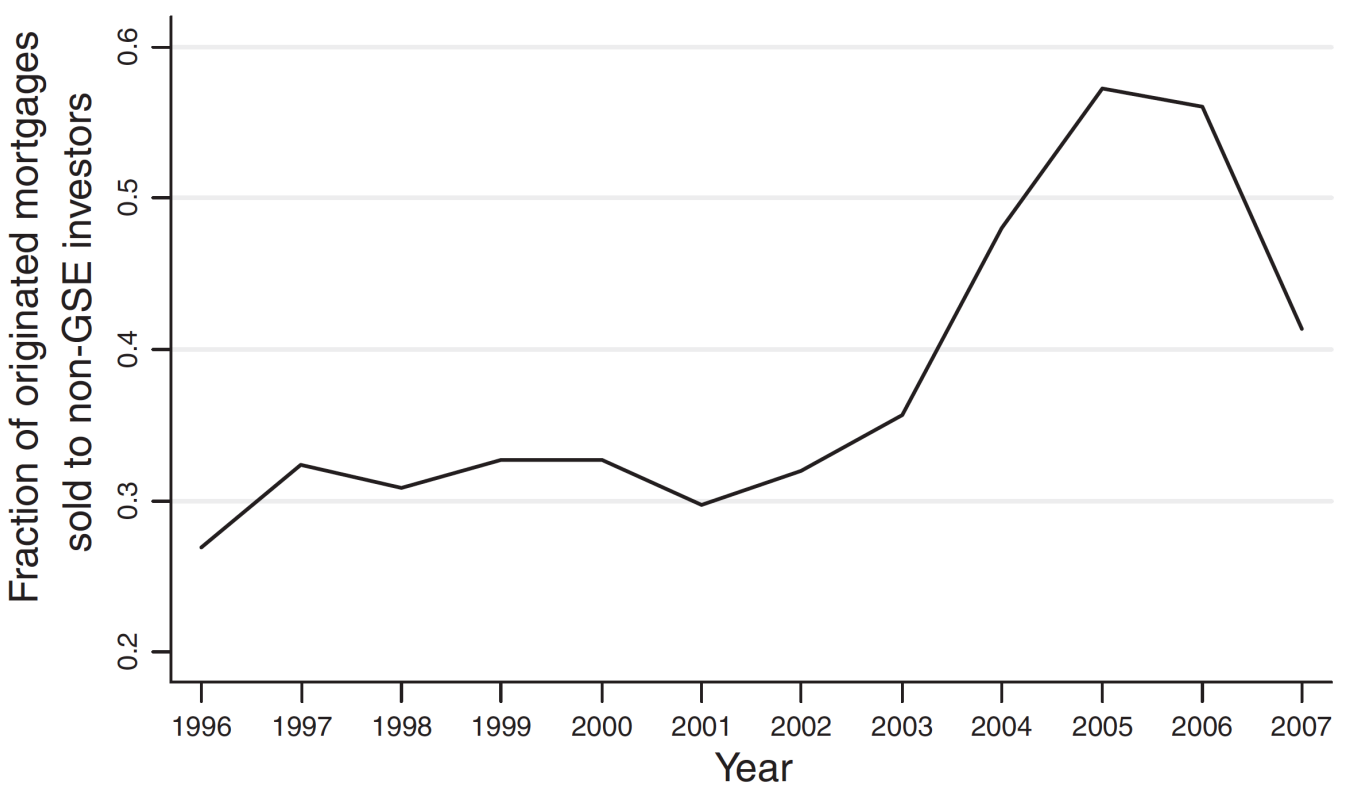
US House price to rent ratios

Motivation

What do we know from the build-up to the great recession?

1. Historically unprecedented increase in house prices relative to fundamentals
2. Relaxation of mortgage financing constraints

Outward shift of mortgage credit supply



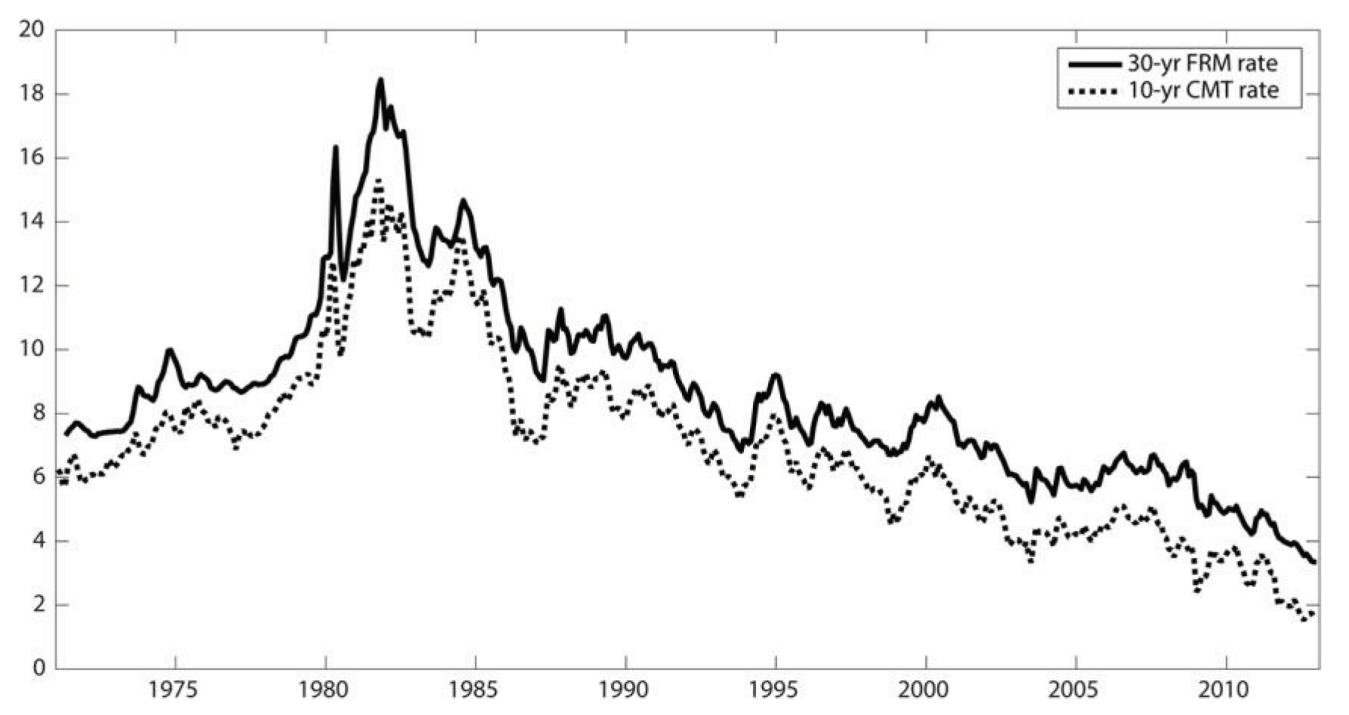
US mortgage origination - Mian & Sufi (2009)

Motivation

What do we know from the build-up to the great recession?

1. Historically unprecedented increase in house prices relative to fundamentals
2. Relaxation of mortgage financing constraints
3. Secular decline in US interest rates

Secular decline in US interest rates

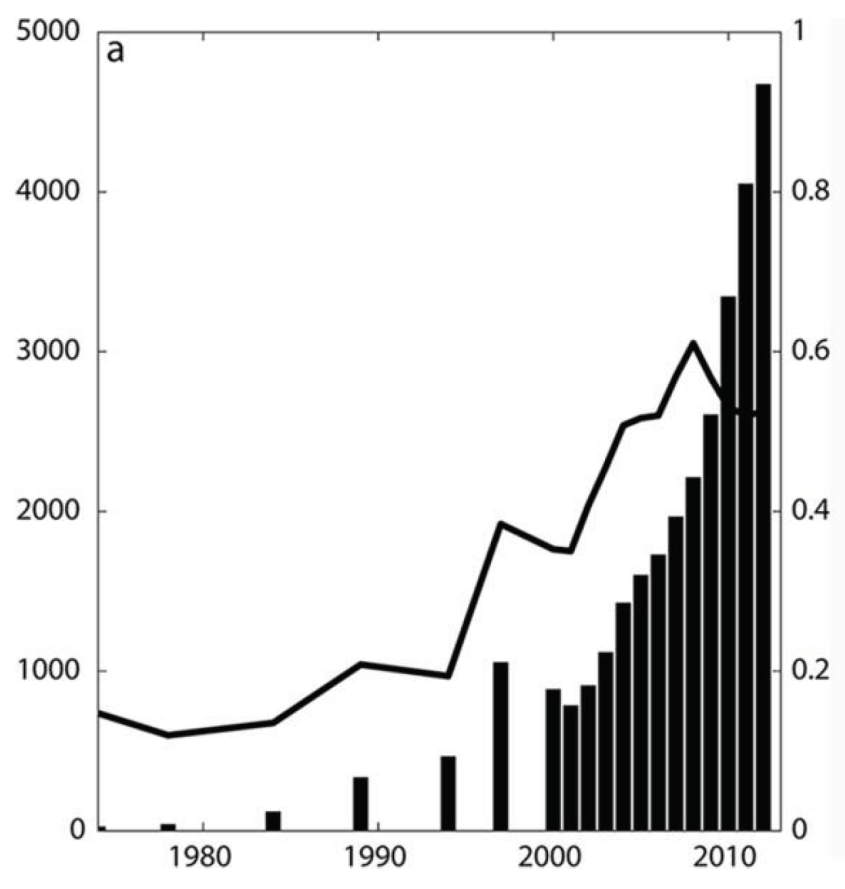


Motivation

What do we know from the build-up to the great recession?

1. Large increase in US house prices relative to fundamentals
2. Relaxation of mortgage financing constraints
3. Secular decline in US interest rates
4. Rise in foreign holdings of US debt

Rise in foreign holdings of US debt



Foreign holdings of US Treasuries increase from 13.5 percent of marketable Treasuries outstanding in 1984 to 61 percent of marketable Treasuries in 2008

Overview

- **This paper**: Examines the effects of (i) a relaxation of financial constraints (ii) a secular decline in interest rates and (iii) foreign investment in US debt on the boom and bust in house prices in the great recession
- **Methodology**: Heterogeneous agent general equilibrium model
  - Heterogenous households who differ in bequest motives
  - Households face idiosyncratic and aggregate risk
- **Findings**
  - A relaxation of financing constraints leads to a large boom in house price
  - The boom in house prices is entirely the result of a decline in the housing risk premium
  - Low interest rates cannot explain high home values
- In this discussion, we'll focus largely on the steady state results

Related literature

- Global capital flows, house prices and the macroeconomy
  - Empirical evidence that declining real interest rates do not provide a plausible explanation for the housing boom - Favilukis, Ludvigson & van Nieuwerburgh (2013) ; Glaeser, Gottlieb, Gyourko (2013)
  - This paper $\rightarrow$ formalizes this mechanism
- Housing and portfolio choice
  - Introduces housing into the portfolio choice problem - Lustig and van Nieuwerburgh (2005, 2010)
  - This paper $\rightarrow$ considers asset pricing in general equilibrium and explicitly models heterogeneous production sector
- Financial constraints and asset prices
  - Changes financial constraints affect asset prices - Mian & Sufi (2009)
  - This paper $\rightarrow$ illustrates the mechanism formally

Contribution to the literature

- Gives credence to the credit supply-based view of the crisis in Mian & Sufi (2009)
  - Relaxation of credit constraints leads to a large boom in house prices
- Reconciles various economic phenomenon present in build up to the housing crisis and great recession
  - Relaxation of mortgage financing constraints
  - Large increase in US house prices relative to fundamentals
  - Secular decline in US interest rates
  - Rise in foreign holdings of US debt
- Introduces time-varying risk premia as a channel for aggregate fluctuations in house prices

Model framework

- Firms exist in one of two sectors (housing sector or consumption sector) and produce one of two goods (housing good or non-housing consumption good)
- Overlapping generations of heterogeneous agents who differ by their bequest motive
  - Agents with a bequest motive (the minority) receive additional utility from net wealth at death
  - New agents born who receive a bequest take on the bequest gene $\rightarrow$ generates realistic wealth distribution through intergenerational persistence of wealth
  - Agents optimize a portfolio of housing (no rental market) and non-housing consumption, including bonds and equity
- Exogenous market of foreign investors who have an exogenous demand for domestic bonds

Firms: Consumption sector

- In each period, a representative firm chooses labor (which it rents) and investment in capital (which it owns) ...

$$Y_{C,t} \equiv K_{C,t}^{\alpha}(Z_{C,t}N_{C,t})^{1-\alpha}$$

- to maximize the value of the firm to its owners

$$V_{C,t} = \max_{N_{C,t},I_{C,t}} E_t \sum_{k=0}^{\infty} \frac{\beta^k \Lambda_{t+k}}{\Lambda_t} D_{C,t+k}$$

$Y_{C,t}$	Firm output	$K_{C,t}^{\alpha}$	Capital	$1-\alpha$	Capital share
$N_{C,t}$	Labour	$Z_{C,t}$	Stochastic productivity	$V_{C,t}$	Firm value
$I_{C,t}$	Investment	$\frac{\beta^k \Lambda_{t+k}}{\Lambda_t}$	Stochastic discount factor	$D_{C,t+k}$	Dividends

Firms: Housing sector

- Firms in the housing sector face a similar choice with the addition of having to utilize an additional factor, $\mathcal{L}_t$, representing land and government permits for construction

$$Y_{H,t} \equiv (Z_{H,t}\mathcal{L}_t)^{1-\phi}(K^{\nu}H, tZ_{H,t}^{1-\nu}N_{H,t}^{1-\nu})^{\phi}$$

- to maximize the value of the firm to its owners

$$V_{H,t} = \max_{N_{H,t}, I_{H,t}} E_t \sum_{k=0}^{\infty} \frac{\beta^k \Lambda_{t+k}}{\Lambda_t} D_{H,t+k}$$

$Y_{H,t}$	Firm output	ν	Construction share	$K_{H,t}^{\alpha}$	Capital
$N_{H,t}$	Labour	$Z_{H,t}$	Stochastic productivity	$V_{H,t}$	Firm value
$I_{H,t}$	Investment	$\frac{\beta^k \Lambda_{t+k}}{\Lambda_t}$	Stochastic discount factor	$D_{H,t+k}$	Dividends
$\mathcal{L}_t$	Land/permits	ν	Capital share of construction		

Risky asset returns

- Firms in the two sectors pay out two returns to shareholders (less dividends)

$$R_{Y_H,t+1} = \frac{V_{H,t+1}}{V_{H_t} - D_{H,t}}$$

$$R_{Y_C,t+1} = \frac{V_{C,t+1}}{V_{C_t} - D_{c,t}}$$

Individuals

- Overlapping generation of individuals, with individuals born every period
- Individuals live through two stages: work and retirement
- Two types of individuals
  1. Minority with bequest motives
  2. Majority without bequest motives
- Upon death, all net worth of an individual is transferred to a new born individual
  - Bequesters leave deliberate requests
  - Non-bequesters leave non-deliberate requests
- New borns who receive deliberate bequests take on a bequest motive $\rightarrow$ **generates persistence in intergenerational wealth and realistic wealth distributions**

Individuals

- Both types of individuals maximize the same utility function

$$U(C^i_{a,t}, H^i_{a,t}) = \frac{\tilde{C}^{1-(1/\sigma)}_{a,t}}{1-(1/\sigma)}$$

- where

$$\tilde{C}_{a,t} = (C^i_{a,t})^{\S}(H^i_{a,t})^{1-\S}$$

$C_{a,t}$	Housing consumption of individual of age a in time t
$H_{a,t}$	Stock of housing
σ^{-1}	Coefficient of relative risk aversion
$\S$	Non-housing share of utility

- Difference between bequesting and non-bequesting agents $\rightarrow$ bequesters receive additional utility from their net worth holdings at the time of death

Non-bequesting individuals

- Individuals *without* a bequest motive maximize the following value function

$$V_a(\mu_t, Z_t, Z^i_{a,t}, W^i_{a,t}, H^i_{a,t}) =$$
$$\max_{H^i_{a+1,t+1}, \theta^i_{a+1,t+1}, B^i_{a+1,t+1}} \{\underbrace{U(C^i_{a,t}, H^i_{a,t})}_{\text{Current utility}}$$
$$+ \beta \underbrace{\pi_{a+1|a}}_{\text{Probability of being alive next period}} E_t[V_{a+1}(\mu_{t+1}, Z_{t+1}, Z^i_{a,t+1}, W^i_{a+1,t+1}, H^i_{a+1,t+1})]\}$$

Bequesting individuals

- Individuals *with* a bequest motive maximize the following value function

$$V_a(\mu_t, Z_t, Z^i_{a,t}, W^i_{a,t}, H^i_{a,t}) =$$

$$\max_{H^i_{a+1,t+1}, \theta^i_{a+1,t+1}, B^i_{a+1,t+1}} \{ \underbrace{U(C^i_{a,t}, H^i_{a,t})}_{\text{Current utility}}$$

$$+ \beta \underbrace{\pi_{a+1|a}}_{\text{Probability of being alive next period}} E_t[V_{a+1}(\mu_{t+1}, Z_{t+1}, Z^i_{a,t+1}, W^i_{a+1,t+1}, H^i_{a+1,t+1})] \}$$

$$+ \beta \underbrace{(1 - \pi_{a+1|a})}_{\text{Probability of dying next period}} E_t[\xi \frac{(W^i_{a+1,t+1} + \rho^H_{t+1} H^i_{a+1,t+1})^{1-(1/\sigma)}}{1 - (1/\sigma)}]$$

- where ξ measures the strength of the bequest motive

Model Calibration

Parameter	Description	Baseline, Model 1	Model 2	Model 3
		Production		
1. φ	Capital adjustment cost	4		
2. δ	Depreciation, K_C, K_H	12% p.a.		
3. δ_H	Depreciation, H	2.5% p.a.		
4. α	Capital share, Y_C	.36		
5. ν	Capital share, Y_H	.30		
6. ϕ	Nonland share, Y_H	.9		
		Preferences		
7. σ^{-1}	Risk aversion	8		
8. χ	Weight on C	.70		
9. β	Time discount factor	.824		
10. ζ	Fraction of bequesters	.10		
11. ξ	Strength of bequest	$10^{15.67}$		
		Demographics and Income		
12. G_a	Age-earnings profile	SCF		
13. $\pi_{a+1\mid a}$	Survival probability	Mortality tables		
14. σ_ϵ	Standard deviation individual earnings	.125		
		Transactions Costs		
15. $\overline{F}$	Participation cost, K	$\approx 1\%\ \overline{C}^i$		
16. ψ_0	Fixed transactions cost, H	$\approx 3.2\%\ \overline{C}^i$		
17. ψ_1	Variable transactions cost, H	$\approx 5.5\%\ p_t^H H^i$		
18. ϖ	Collateral constraint	25%	1%	1%
19. λ	Borrowing cost	5.5%		
		Foreign Supply		
20. B^F	Foreign capital	0	0	18% $\overline{Y}$

- The paper considers three models with unique calibrations
- The second model reduces the collateral constraint in order to simulate an outward shift in credit supply
- The third model then introduces foreign demand for domestic bonds

Benchmark life cycle results

Quantity	Standard Deviation (1)	Corr. with GDP (2)	Autocorrelation (3)	Share of GDP (4)	Standard Deviation (1)	Corr. with GDP (2)	Autocorrelation (3)	Share of GDP (4)
	A. Data (1953–2012)				B. Model 1			
Y	3.00	1.00	.51	1.00	2.92	1.00	.21	1.00
C_T	1.90	.92	.65	.80	2.27	.96	.29	.70
C_H	1.45	.55	.71	.14	2.74	.96	.33	.26
C	2.14	.92	.63	.66	2.05	.94	.26	.44
$p^H Y_H$	13.95	.77	.60	.06	13.51	.63	.14	.05
I	9.07	.82	.33	.14	3.91	.95	.09	.24
I_T	8.84	.93	.40	.20	4.78	.96	.11	.29
	C. Model 2				D. Model 3			
Y	2.87	1.00	.19	1.00	3.07	1.00	.21	1.00
C_T	2.14	.95	.25	.69	2.75	.94	.28	.69
C_H	2.47	.96	.28	.23	3.12	.96	.33	.23
C	1.99	.93	.22	.46	2.59	.93	.25	.46
$p^H Y_H$	13.67	.60	.13	.06	15.06	.76	.13	.06
I	4.05	.95	.14	.24	5.24	.95	.12	.24
I_T	4.88	.96	.13	.30	6.44	.97	.12	.30

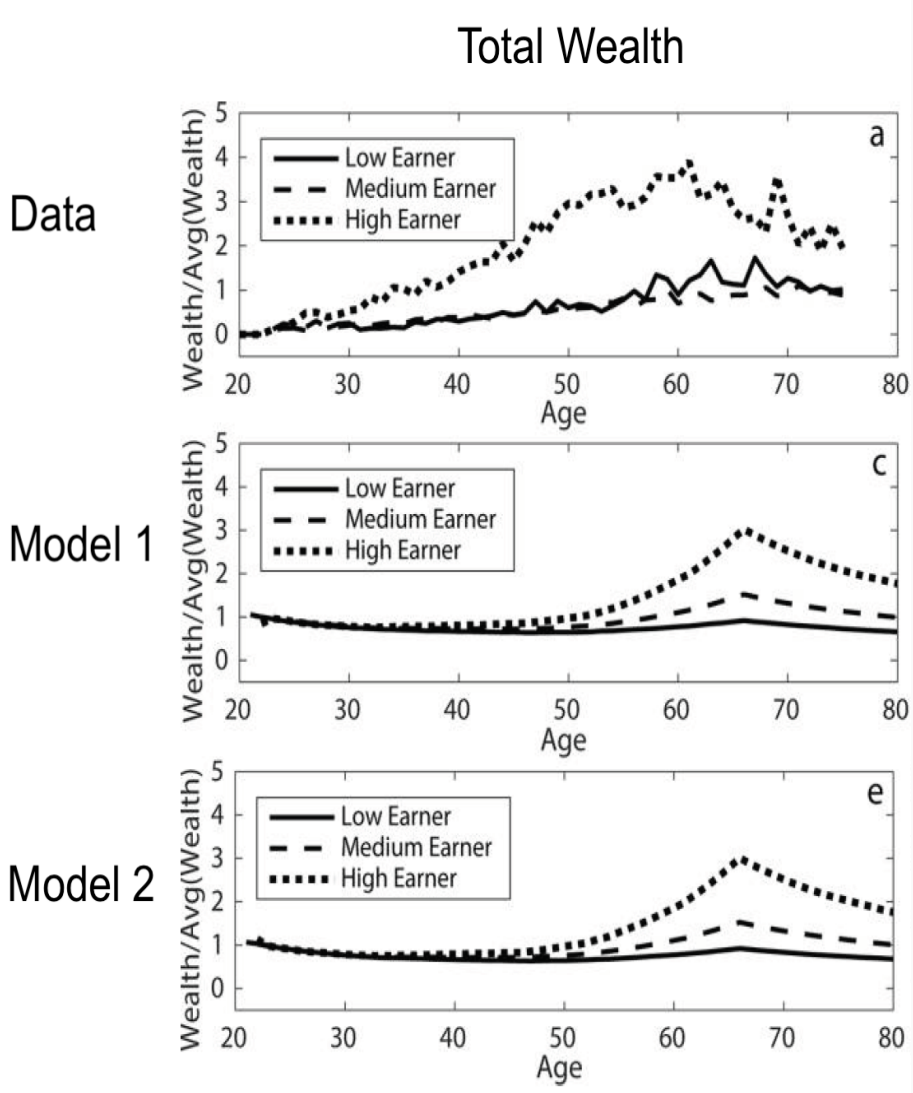
- All three models match various moments from the data
- Consumption is less volatile than GDP
- Total investment is more volatile than output - model however understates volatility

Benchmark life cycle results

Quantity	Standard Deviation (1)	Corr. with GDP (2)	Autocorrelation (3)	Share of GDP (4)	Standard Deviation (1)	Corr. with GDP (2)	Autocorrelation (3)	Share of GDP (4)
	A. Data (1953–2012)				B. Model 1			
Y	3.00	1.00	.51	1.00	2.92	1.00	.21	1.00
C_T	1.90	.92	.65	.80	2.27	.96	.29	.70
C_H	1.45	.55	.71	.14	2.74	.96	.33	.26
C	2.14	.92	.63	.66	2.05	.94	.26	.44
$p^H Y_H$	13.95	.77	.60	.06	13.51	.63	.14	.05
I	9.07	.82	.33	.14	3.91	.95	.09	.24
I_T	8.84	.93	.40	.20	4.78	.96	.11	.29
	C. Model 2				D. Model 3			
Y	2.87	1.00	.19	1.00	3.07	1.00	.21	1.00
C_T	2.14	.95	.25	.69	2.75	.94	.28	.69
C_H	2.47	.96	.28	.23	3.12	.96	.33	.23
C	1.99	.93	.22	.46	2.59	.93	.25	.46
$p^H Y_H$	13.67	.60	.13	.06	15.06	.76	.13	.06
I	4.05	.95	.14	.24	5.24	.95	.12	.24
I_T	4.88	.96	.13	.30	6.44	.97	.12	.30

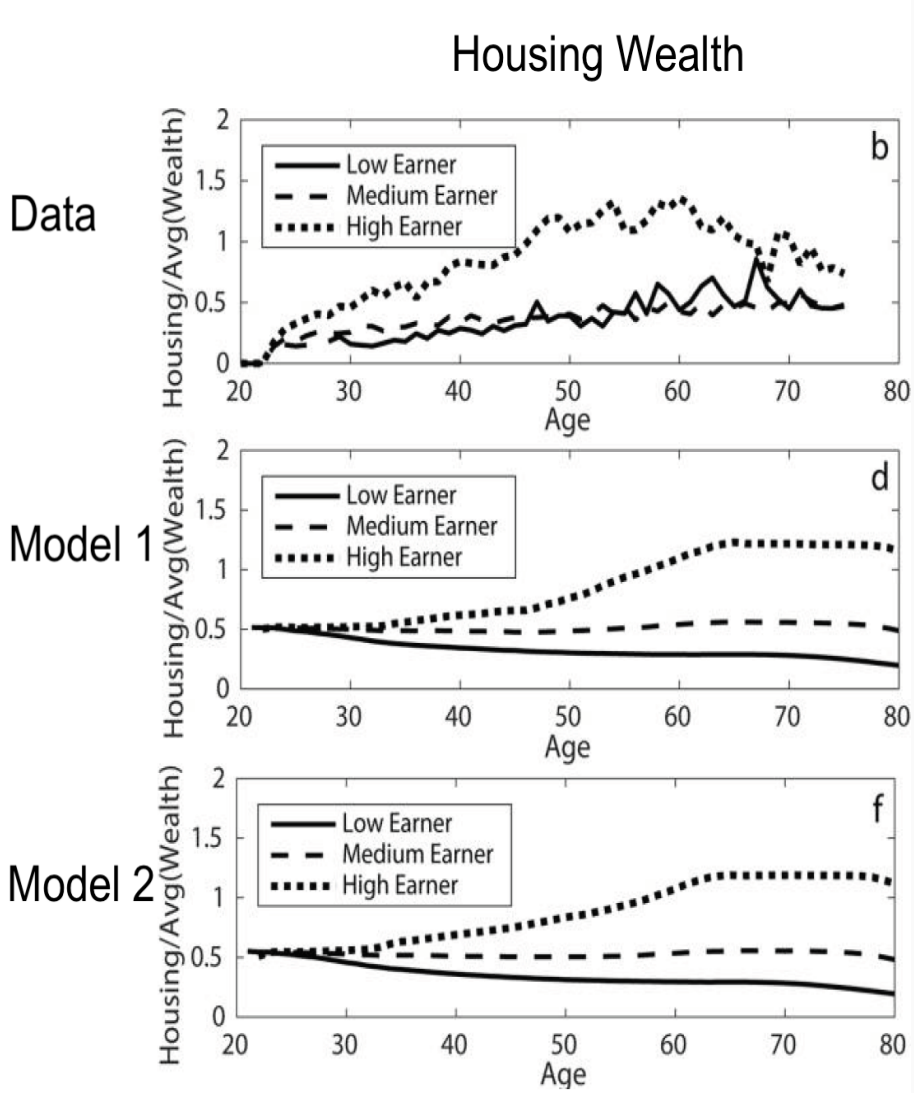
- Model matches the relative volatility of residential investment to output
- Residential investment is less correlated with output than consumption and total investment

Benchmark life cycle results



- Wealth is hump-shaped over the life cycle - agents accumulate wealth over time
- Households hold some financial worth late in life $\rightarrow$ insure against the possibility of living long into old age
- Non-bequesting households reduce their net worth after retirement

Benchmark life cycle results



- Housing wealth remains high until death $\rightarrow$ consequence of the lack of a rental housing market in the model

Portfolio share results

- What do we learn from the data?

HOUSING WEALTH RELATIVE TO TOTAL WEALTH

Year/Model	All (1)	Young (2)	Old (3)	Poor (4)	Medium (5)	Rich (6)	Y/P (7)	Y/M (8)	Y/R (9)	O/P (10)	O/M (11)	O/R (12)
	A. Data (SCF)											
2001	.44	.75	.42	1.49	.74	.34	3.84	1.33	.52	1.36	.70	.33
2004	.53	1.09	.50	1.72	.84	.42	4.19	1.81	.77	1.56	.79	.40
2007	.53	1.04	.50	1.81	.91	.41	5.79	1.91	.69	1.61	.85	.40
2010	.51	1.17	.49	2.26	.91	.39	7.82	2.28	.73	2.07	.86	.38
	B. Model											
Model 1	.58	.63	.56	1.63	1.18	.31	2.11	2.03	.36	1.54	1.08	.29

- Young households (35 years and under) hold most of their wealth in housing (consumer durables)

- A tremendous increase in housing wealth for poor households $\rightarrow$ Mian & Sufi (2009)

Portfolio share results II

Housing Wealth Relative to Total Wealth

Year/Model	All (1)	Young (2)	Old (3)	Poor (4)	Medium (5)	Rich (6)	Y/P (7)	Y/M (8)	Y/R (9)	O/P (10)	O/M (11)	O/R (12)
	A. Data (SCF)											
2001	.44	.75	.42	1.49	.74	.34	3.84	1.33	.52	1.36	.70	.33
2004	.53	1.09	.50	1.72	.84	.42	4.19	1.81	.77	1.56	.79	.40
2007	.53	1.04	.50	1.81	.91	.41	5.79	1.91	.69	1.61	.85	.40
2010	.51	1.17	.49	2.26	.91	.39	7.82	2.28	.73	2.07	.86	.38
	B. Model											
Model 1	.58	.63	.56	1.63	1.18	.31	2.11	2.03	.36	1.54	1.08	.29

- Effects are amplified for young and poor households
  - Hold greatest shares of housing wealth
  - Increased housing wealth by the greatest share - 3.84 of total wealth in 2001 to 7.82 of total wealth in 2010
- Model approximates the data well

Asset pricing results

Return Moments

Data/Model	$E[R_E]$ (1)	$\text{Std}[R_E]$ (2)	$E[R_H]$ (3)	$E[R_f]$ (4)	$\text{Std}[R_f]$ (5)	$E[R_E^{ex}]$ (6)	$E[R_H^{ex}]$ (7)	$SR[R_E]$ (8)	$\Delta p^H/\mathcal{R}$ (9)	$E_N[R_H]$ (10)	$E_N[R_H^{ex}]$ (11)	$\text{Std}_N[R_H]$ (12)
						A. Data						
Data 1 (1953–2012)	8.24	18.72	10.83	1.38	2.56	6.88		.38	31.1%			
Data 1 (1976–2012)	8.70	16.81	10.44	1.87	2.83	6.85		.42	31.1%			
Data 2 (1976–2012)	8.70	16.81	9.23	1.87	2.83	6.85		.42	48.9%			
Data 3 (1976–2012)	8.70	16.81	10.04	1.87	2.83	6.85		.42	32.4%			
						B. Model						
Model 1	4.51	8.44	11.44	1.70	3.26	2.81	9.74	.37		9.33	7.63	9.30

- Model matches various stylized features of the data
  - Equity returns more volatile than housing returns
- Understates volatility of equity returns

What is the effect of a relaxation in credit constraints?

- A reduction in the downpayment requirement from 20% to 1%

HOUSING WEALTH RELATIVE TO TOTAL WEALTH

Year/Model	All (1)	Young (2)	Old (3)	Poor (4)	Medium (5)	Rich (6)	Y/P (7)	Y/M (8)	Y/R (9)	O/P (10)	O/M (11)	O/R (12)
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Model 2	.59	.69	.57	1.78	1.27	.31	2.70	2.57	.38	1.65	1.13	.29

- Households increase housing consumption
  - The effect is largest for young poor households
  - Implication: poorer households are relatively more constrained than other households $\rightarrow$ greater increase in demand

What is the effect of a relaxation in credit constraints?

- A reduction in the downpayment requirement from 20% to 1%

RETURN MOMENTS

Data/Model	$E[R_E]$ (1)	$\text{Std}[R_E]$ (2)	$E[R_H]$ (3)	$E[R_f]$ (4)	$\text{Std}[R_f]$ (5)	$E[R_E^{ex}]$ (6)	$E[R_H^{ex}]$ (7)	$SR[R_E]$ (8)	$\Delta p^H/\mathcal{R}$ (9)	$E_N[R_H]$ (10)	$E_N[R_H^{ex}]$ (11)	$\text{Std}_N[R_H]$ (12)
Model 1	4.51	8.44	11.44	1.70	3.26	2.81	9.74	.37		9.33	7.63	9.30
Model 2	4.62	8.55	9.45	2.04	3.42	2.58	7.42	.33	20.1%	7.55	5.51	7.35

- Equity risk premium and equity Sharpe ratio fall
  - How does this channel work?
  - Housing collateral reduces the sensitivity of households to consumption shocks
  - Lower downpayment restrictions $\rightarrow$ increased housing demand $\rightarrow$ Increased housing wealth (collateral) $\rightarrow$ greater risk sharing (housing collateral provides insurance against consumption shocks) $\rightarrow$ reduces equity risk premium
  - This in turn lowers the housing risk premium
  - Housing collateral channel - Lustig & van Nieuwerburgh (2005)

What is the effect of a relaxation in credit constraints?

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RETURN MOMENTS

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Model 1	4.51	8.44	11.44	1.70	3.26	2.81	9.74	.37		9.33	7.63	9.30
Model 2	4.62	8.55	9.45	2.04	3.42	2.58	7.42	.33	20.1%	7.55	5.51	7.35

- Housing risk premium falls and house prices rise substantially - around 20% higher
- Real interest rates rise
  - Relaxation of borrowing constraints reduces precautionary savings

What is the effect of a relaxation in credit constraints?

- The model therefore generates three findings
  1. A decrease in the housing risk premium
  2. A rise in house prices
  3. An increase in real interest rates

- Implication: the rise in house prices as a result of a relaxation in credit constraints is **entirely attributable** to a decline in the housing risk premium

- The decline in the housing risk premium is strong enough to offset the effect of an increase in interest rates

- The model is however unable to capture the secular fall in interest rates seen in the data

What is the effect of foreign demand for domestic assets?

- A reduction in the downpayment requirement from 20% to 1% **and** an increase in the foreign demand for domestic bonds equal to 18% of GDP

HOUSING WEALTH RELATIVE TO TOTAL WEALTH

Year/Model	All (1)	Young (2)	Old (3)	Poor (4)	Medium (5)	Rich (6)	Y/P (7)	Y/M (8)	Y/R (9)	O/P (10)	O/M (11)	O/R (12)
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Model 2	.59	.69	.57	1.78	1.27	.31	2.70	2.57	.38	1.65	1.13	.29
Model 3	.61	.71	.59	1.76	1.28	.31	2.47	2.58	.39	1.65	1.14	.29

- Increased demand for housing $\rightarrow$ Relaxation of credit constraints together with lower interest rates as a result of foreign demand for domestic assets

What is the effect of foreign demand for domestic assets?

- A reduction in the downpayment requirement from 20% to 1% **and** an increase in the foreign demand for domestic bonds equal to 18% of GDP

RETURN MOMENTS

Data/Model	$E[R_E]$ (1)	$\text{Std}[R_E]$ (2)	$E[R_H]$ (3)	$E[R_f]$ (4)	$\text{Std}[R_f]$ (5)	$E[R_E^{ex}]$ (6)	$E[R_H^{ex}]$ (7)	$SR[R_E]$ (8)	$\Delta p^H/\mathcal{R}$ (9)	$E_N[R_H]$ (10)	$E_N[R_H^{ex}]$ (11)	$\text{Std}_N[R_H]$ (12)
Model 1	4.51	8.44	11.44	1.70	3.26	2.81	9.74	.37		9.33	7.63	9.30
Model 2	4.62	8.55	9.45	2.04	3.42	2.58	7.42	.33	20.1%	7.55	5.51	7.35
Model 3	5.10	11.04	9.58	1.60	4.69	3.50	7.97	.35	20.5%	8.10	6.50	8.78

- As compared to model 2, real interest rates now fall
  - Captures the secular decline in interest rates found in the data
- House prices are only 0.5 percentage points higher than model 2
- Implication: boom in house prices does not come from lower interest rates induced by foreign demand for domestic bonds and is entirely attributable to a relaxation of credit constraints

What is the effect of foreign demand for domestic assets?

- A reduction in the downpayment requirement from 20% to 1% **and** an increase in the foreign demand for domestic bonds equal to 18% of GDP

RETURN MOMENTS

Data/Model	$E[R_E]$ (1)	$\text{Std}[R_E]$ (2)	$E[R_H]$ (3)	$E[R_f]$ (4)	$\text{Std}[R_f]$ (5)	$E[R_E^{ex}]$ (6)	$E[R_H^{ex}]$ (7)	$SR[R_E]$ (8)	$\Delta p^H/\mathcal{R}$ (9)	$E_N[R_H]$ (10)	$E_N[R_H^{ex}]$ (11)	$\text{Std}_N[R_H]$ (12)
Model 1	4.51	8.44	11.44	1.70	3.26	2.81	9.74	.37		9.33	7.63	9.30
Model 2	4.62	8.55	9.45	2.04	3.42	2.58	7.42	.33	20.1%	7.55	5.51	7.35
Model 3	5.10	11.04	9.58	1.60	4.69	3.50	7.97	.35	20.5%	8.10	6.50	8.78

- Why does foreign capital have such a small effect on house prices?
  - Foreign demand for bonds (safe asset) $\rightarrow$ reduces supply of safe asset and crowds out locals $\rightarrow$ (portfolio) investment in equity and housing becomes more risky as reduced safe asset holdings exposes locals to systematic equity and housing risk $\rightarrow$ equity and housing premium rise
  - As a result of endogenous response of risk premia, an influx of foreign capital to the bond market has limited effects on house prices

What does the paper teach us about the crisis?

- The major contribution of this paper is the reconciliation of various phenomenon in build up to the housing crisis and great recession
- The model generates an endogenous increase in house prices following a relaxation of credit constraints
- A relaxation of credit constraints cannot however explain the secular decline in interest rates
  - Equilibrium real interests rates in fact increase as households increase precautionary savings
- Introducing foreign demand for domestic bonds generates decreases in the real interest rate consistent with the data

What does the paper teach us about the crisis? II

- While the introduction of foreign capital decreases interest rates, this decrease does not lead to meaningful increases in house prices
- Implication: the increase household debt and house prices in the buildup to the housing crisis is entirely attributable to a decline in the housing risk premium following a relaxation of credit constraints, irrespective of low interest rates
- The results reconcile the credit supply view of the crisis in Mian & Sufi (2009) and illustrate the mechanism through which a relaxation of mortgage financing constraints leads to increased house prices
    - This response of demand to changes in financial constraints is strongest for poor and young households, who are typically the most credit constrained with respect to mortgage finance

What does the paper teach us about financial stability?

- Changes in interest rates cannot give us a full picture of household demand for housing and house prices
  - Changes in house prices are instead strongly driven by the housing risk premium
- Housing does not exist in isolation but instead must be considered as part of the household's portfolio of wealth
  - Changes in the demand for housing and the housing risk premium are strongly affected by events in the equity and bond markets
  - Highlights the role of housing collateral as an insurance mechanism against consumption shocks