Household Portfolios, Monetary Policy and Asset Prices

Matteo Leombroni[1] Ciaran Rogers[2]

[1]Boston College

[2]HEC Paris

Motivation

- In 2014/2015 the ECB introduced a number of policies aimed at reducing medium and long-term yields
- This prompts a discussion on the effects of these policies on:
  - Asset prices
  - Risk Premia
  - Heterogeneous effects on wealth and consumption

This paper

Framework

Introduce heterogeneous life-cycle model with incomplete markets asset-pricing:

- Multiple assets and aggregate risk
- Match aggregates of household portfolios in the Euro area

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Preview of Results

Following a reduction in the interest rate, households rebalance towards riskier assets, inducing:

- Increase in equilibrium asset prices
- Increase in risk premia
- Positive, heterogeneous effect on wealth and consumption (decreasing in age)

Data

Data Organization

Source Household Finance and Consumption Survey

- Available for 20 EU member states (harmonised); use 2014 wave
- Household-level data on income, wealth and portfolios

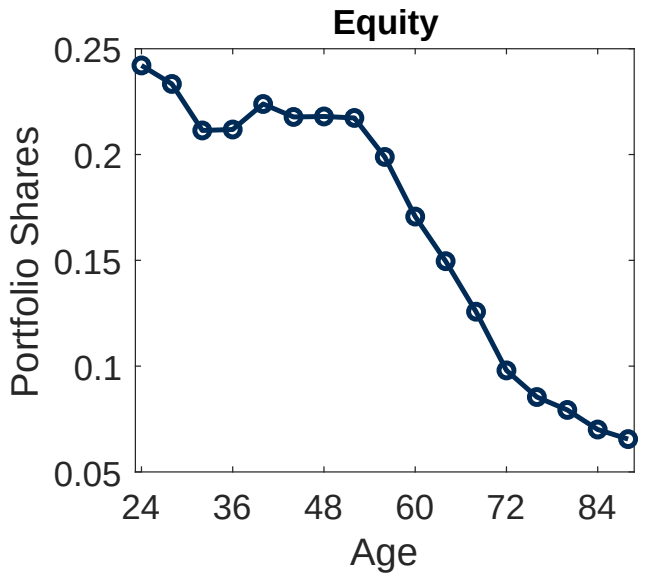
Variables: Collect at household level

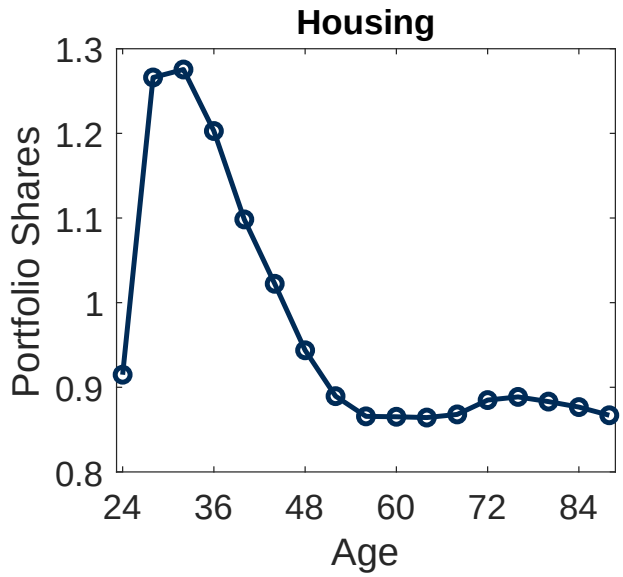
- Equity (including listed shares, personal business...)
- Housing (main residence and other real estate)
- Net Bond Holdings (Bonds+Deposits-Debt)
- Investment in Mutual Funds and Pension Funds

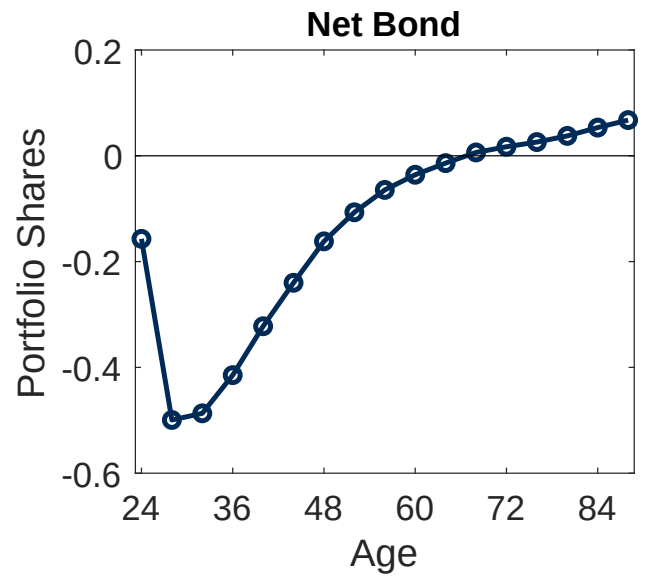
Look-Through: We use EEA to estimate portfolio allocation of Mutual Funds and Pension Funds (intermediaries)

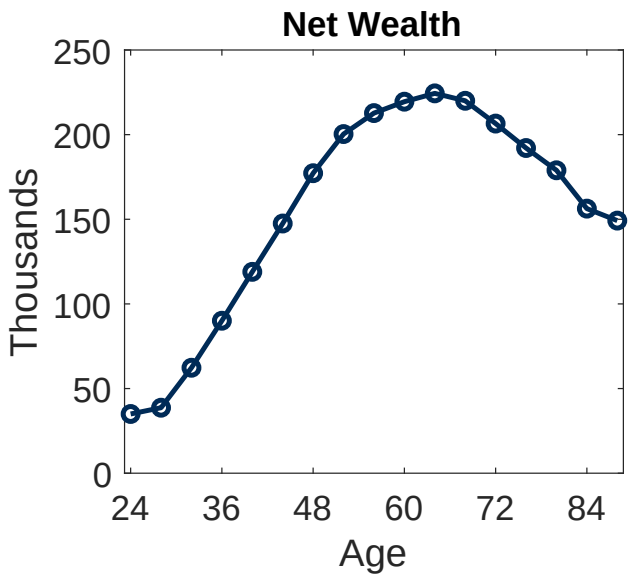
- We apportion the indirect investment through intermediaries (look-through)

Portfolio shares: Average









Subcohorts

Model

Framework Outline

Household Sector

- Each cohort solves a life cycle problem with portfolio choice
- Each period is 4 years
- Exogenous beliefs over asset return distribution

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Equilibrium

- Asset prices endogenously adjust to clear current asset markets in equilibrium (temporary equilibrium)
    - For now, fix prices at some level, consider equilibrium at monetary policy exercise

Financial Assets and Income

- **Bonds** pay a real return:

$$R^B_{t+1} = \frac{1 + i_t}{\pi_{t+1}}$$

where i_t is the nominal return and π_{t+1} is the inflation rate. Households can short bonds (borrow) by paying a spread ρ_{sp}.

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- **Equity** and **Housing** are trees with aggregate payoff $(\Pi^E_{t+1}, \Pi^H_{t+1})$ and prices (p^E_t, p^H_t).
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- **Labor Income:** deterministic age profile, with permanent and transitory shocks:

$$Y_{i,t} = \underbrace{P_{i,t}}_{\substack{\text{Permanent} \\ \text{Income}}} \underbrace{U_{i,t}}_{\substack{\text{Transitory} \\ \text{Shocks}}}$$

$$P_{i,t} = \underbrace{\exp(f(a))}_{\text{Age profile}} P_{i,t-1} \underbrace{N_{i,t}}_{\substack{\text{Permanent} \\ \text{Shocks}}}$$

Household Problem

- Epstein-Zin preferences:

$$\max_{\{\theta^E_{i,t},\theta^H_{i,t},B^+_{i,t},B^-_{i,t},C_{i,t}\}_{t=0}^{T-a}} E_0\left[V_{a,0}(W_0,P_0)\right]$$

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- Wealth Evolution

$$W_{i,t+1} = \underbrace{\theta^E_{i,t}}_{\substack{\text{Equity}\\ \text{Shares}}} \Pi^E_{t+1} + \underbrace{\theta^H_{i,t}}_{\substack{\text{Housing}\\ \text{Shares}}} \Pi^H_{i,t+1} + \underbrace{B^+_{i,t}}_{\text{Bond}} R^B_{t+1} - \underbrace{B^-_{i,t}}_{\text{Debt}} \left(R^B_{t+1} + \rho_{sp}\right) + \underbrace{Y_{i,t+1}}_{\text{Income}}$$

Beliefs

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- Household expectations about future payoffs assumed to be:

$$\Pi^E_{t+1} = p^E_t e^{\epsilon^E_{t+1}}, \quad \epsilon^E_{t+1} \sim N(\mu^E_t, f^E \sigma^2_E)$$
$$\Pi^H_{t+1} = p^H_t e^{\epsilon^H_{t+1}} \quad \epsilon^H_{t+1} \sim N(\mu^H_t, f^H \sigma^2_H)$$
$$\pi_{t+1} = e^{\epsilon^\pi_{t+1}}, \quad \epsilon^\Pi_{t+1} \sim N(\mu^\pi_t, \sigma^2_\pi)$$

where:

- $(\mu^E_t, \mu^H_t, \mu^\pi_t, \sigma_E, \sigma_H, \sigma_\pi)$ are based on historical moments
- (f^E, f^H) scale the variance to take into account idiosyncratic risk (calibrated parameters)

Calibration

Calibration to 2014

Initial wealth

- From the HFCS we measure initial wealth of household i as:

$$W_{i,2014} = \underbrace{H_{i,2014}}_{\text{Housing}} + \underbrace{E_{i,2014}}_{\text{Equity}} + \underbrace{B_{i,2014}}_{\text{Net Bonds}} + \underbrace{C_{i,2014}}_{\text{Consumption}}$$

- We then endow households i with $W_{i,2014}$.
- Three types of households: Bottom 40, Mid 40 and Top 20.

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Asset Returns

- We estimate the mean and variance of asset returns based on historical data
- Initial prices (p^E_{2014}, p^H_{2014}) set equal to household demand in 2014

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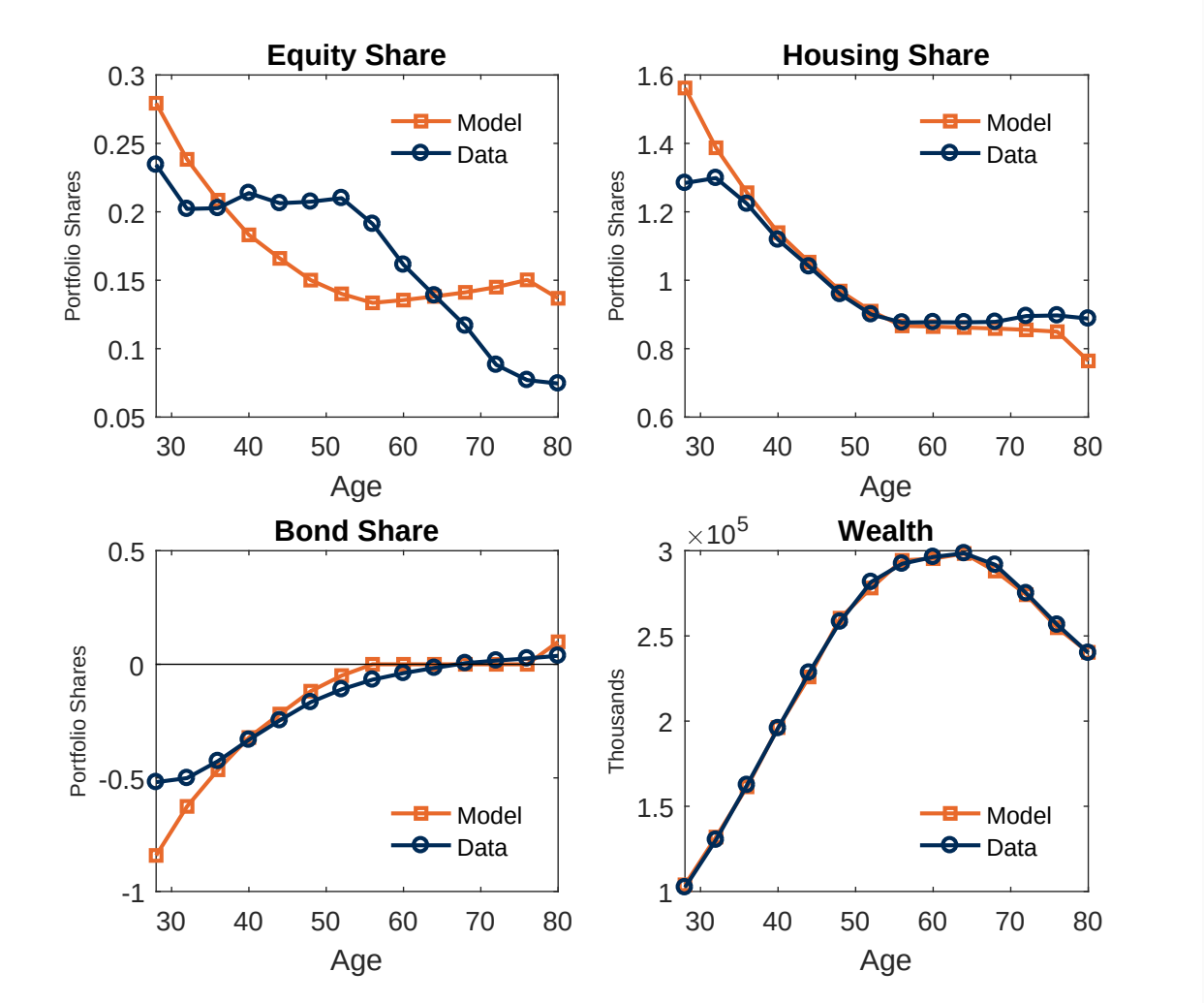
Calibrated Parameters

- Utility function parameters: (σ, γ, ϕ_B)
- Idiosyncratic asset return variances (f^H, f^E)
- Borrowing spread ρ_{sp}

to target aggregate portfolio shares, net lending and borrowing. Results

Model vs Data



Asset pricing

Equilibrium asset pricing

We introduce an equilibrium asset pricing framework to measure the impact of the change in the interest rate.

Temporary Equilibrium: prices adjust to clear current markets ONLY

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Temporary Equilibrium: prices adjust to clear current markets ONLY

- Household expectations about future payoffs, future prices, and income are exogenous and fixed
- Higher current prices lower demand by reducing expected returns for given payoff expectations
  - $R^{E,NEW}_{2018} = \frac{\Pi^{E}_{2018}}{p^{E,NEW}_{2014}} \quad ; \quad R^{H}_{2018} = \frac{\Pi^{H}_{2018}}{p^{H,NEW}_{2014}}$

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- Household expectations about future payoffs, future prices, and income are exogenous and fixed
- Higher current prices lower demand by reducing expected returns for given payoff expectations
  - $R_{2018}^{E,NEW} = \frac{\Pi_{2018}^{E}}{p_{2014}^{E,NEW}}$; $R_{2018}^{H} = \frac{\Pi_{2018}^{H}}{p_{2014}^{H,NEW}}$
- In baseline calibration, $(p_{2014}^{E}, p_{2014}^{H})$ clear current asset markets
  - Supply, $(p_{2014}^{E}, p_{2014}^{H})$, set equal to household demand in data
  - Model calibrated such that demand equals the data
- BUT when shocks occur, prices deviate from baseline

Equilibrium

Housing, Equity Market Clearing

$$\sum_i E_{i,0}(a_0, W_{i,0}, P_{i,0}, i_0, p_0^E, p_0^H) = p_0^E$$

$$\sum_i H_{i,0}(a_0, W_{i,0}, P_{i,0}, i_0, p_0^E, p_0^H) = p_0^H$$

where

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Monetary Policy Shocks

Timing

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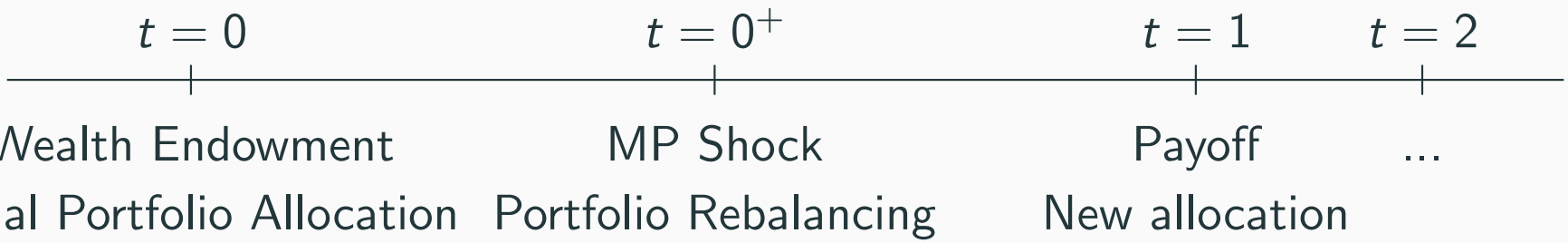

At time $t = 0$:

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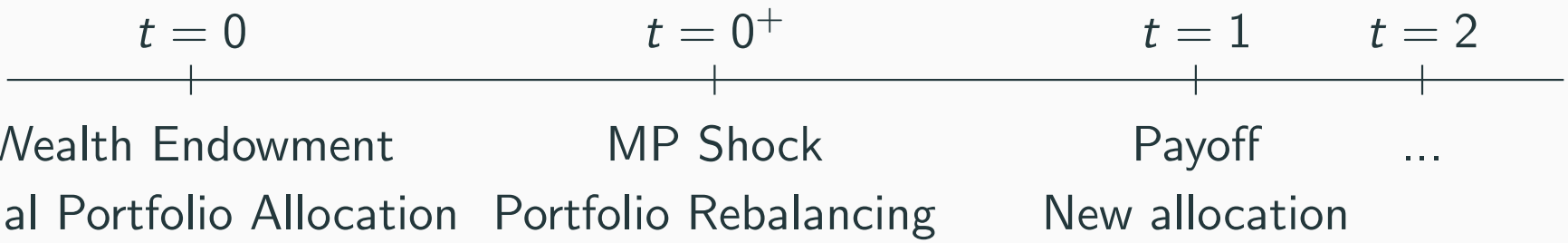

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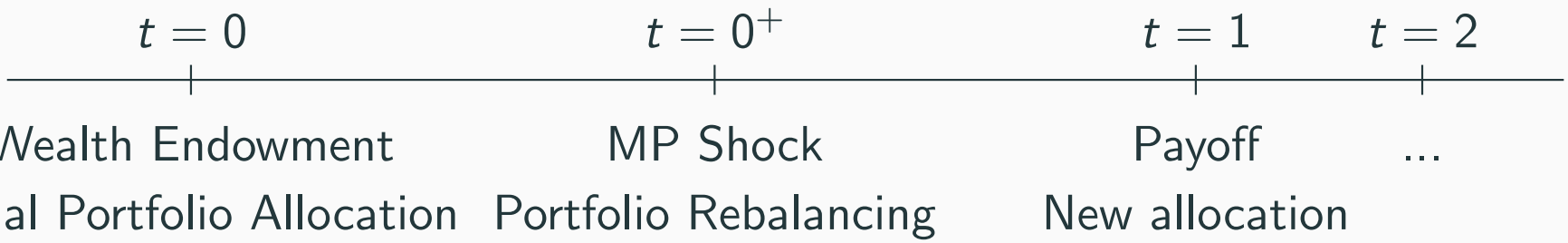

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At time $t = 1$:

- Payoffs are received
- Portfolio allocation

...

Monetary Policy Shock

Monetary Policy Shock: CB changes the nominal rate:

$$\bar{i}_{0^+} = i_0 + \underbrace{\bar{v}_{0^+}}_{\text{MP Shock}}$$

The policy is implemented by reducing the supply of bonds available to households

Shock Size: $\bar{v}_{0^+} = -21 bps$

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Assumptions

- Expectations of future labor income unchanged
- Expectations of future payoffs $\{\Pi^E_{t+1}, \Pi^H_{t+1}\}_{t=0}^{\infty}$, nominal interest rates and inflation: $\{i_{t+1}, \pi_{t+1}\}_{t=0}^{\infty}$ unchanged
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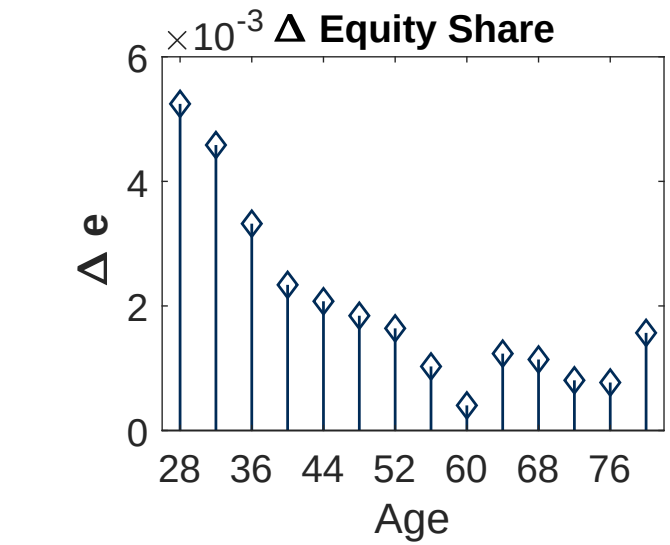
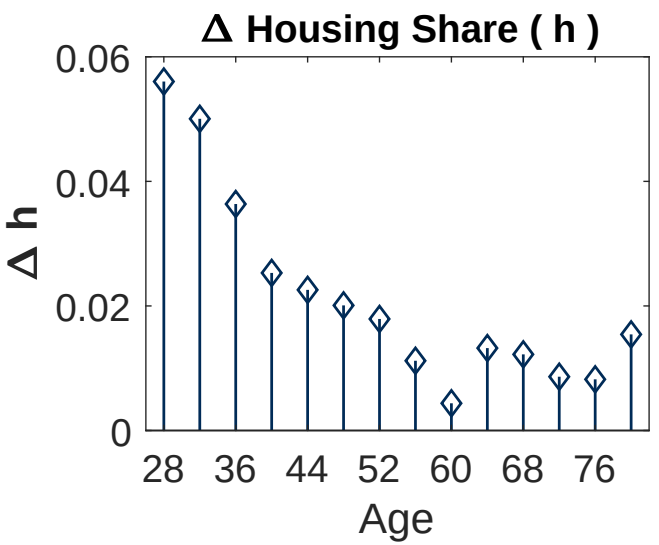
Market clearing

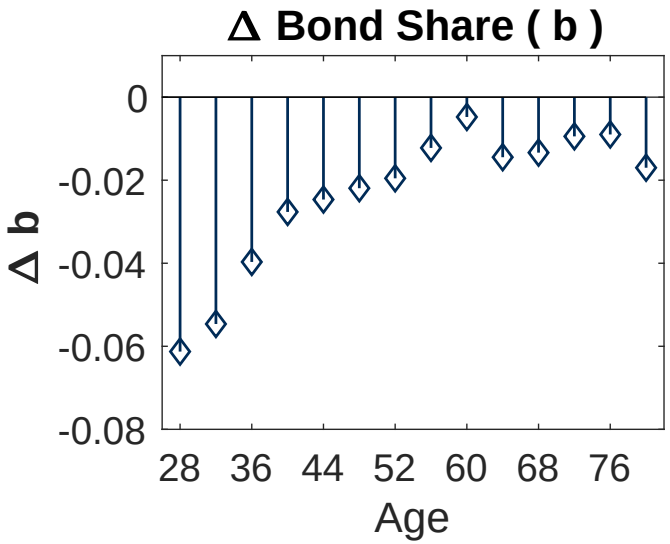
- Asset prices $(p^E_{0^+}, p^H_{0^+})$ adjust to clear the asset markets post shocks.

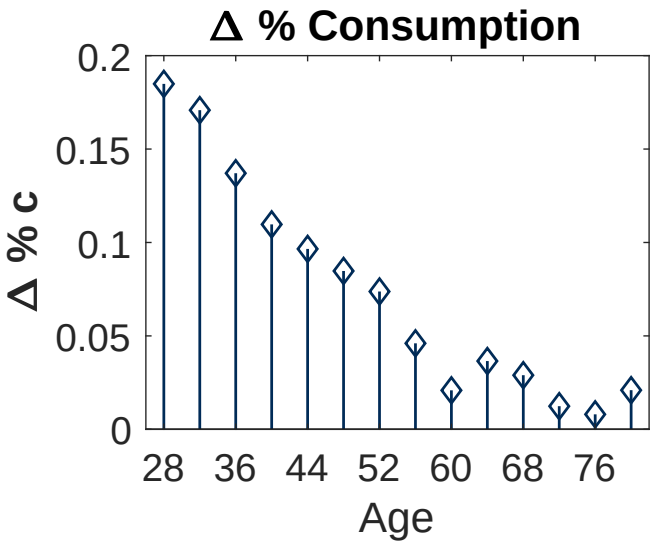
Results

Δ Portfolio Shares, Consumption: Constant Wealth









Equilibrium Asset Prices and Risk Premia

$$\sum_i E_{i,0}(a_0, W_{i,0}, P_{i,0}, i_0, p_0^E, p_0^H) = p_0^E$$

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$$\sum_i E_{i,0}(a_0, W_{i,0}, P_{i,0}, \bar{i}_{0+}, p_0^E, p_0^H) > p_0^E$$

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Effects on Asset Risk Premia

- Risk premium on **housing** increases by **7.5bps**
- Risk premium on **equity** increases by **5bps**

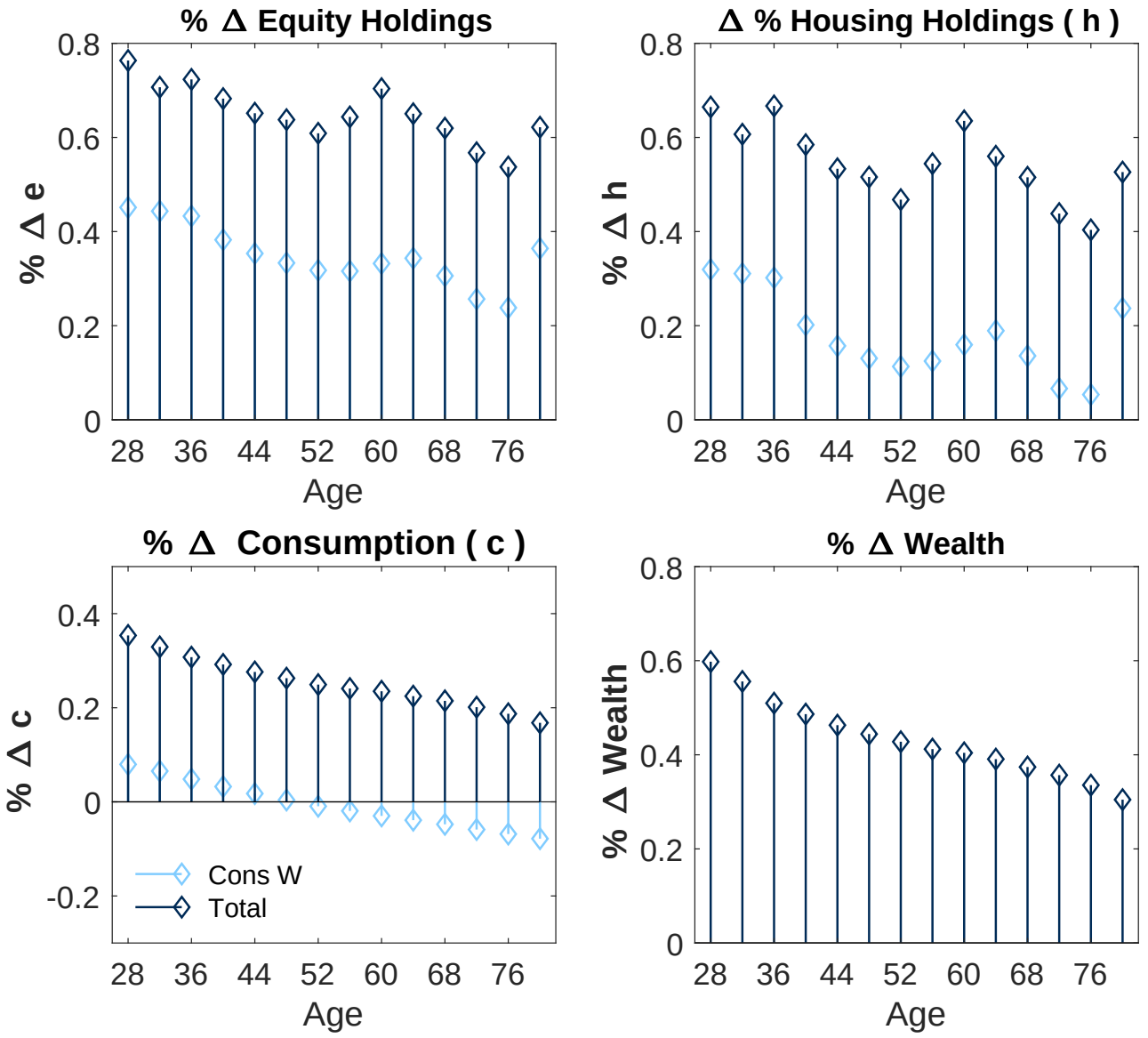
Two counteracting forces:

- Risk Compensation: households have to be compensated to hold more risky assets in equilibrium
- Risk Tolerance: change in wealth prompts an increased willingness to save and hold risk

Overall, risk-premia increase as 'risk compensation' effect dominates

Paper Extension: Conditions for risk premium to fall (Δ Labor income VAR)

Δ Portfolio Shares, Consumption: New Equilibrium



Summary of Results

Risk premia

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Wealth and Consumption

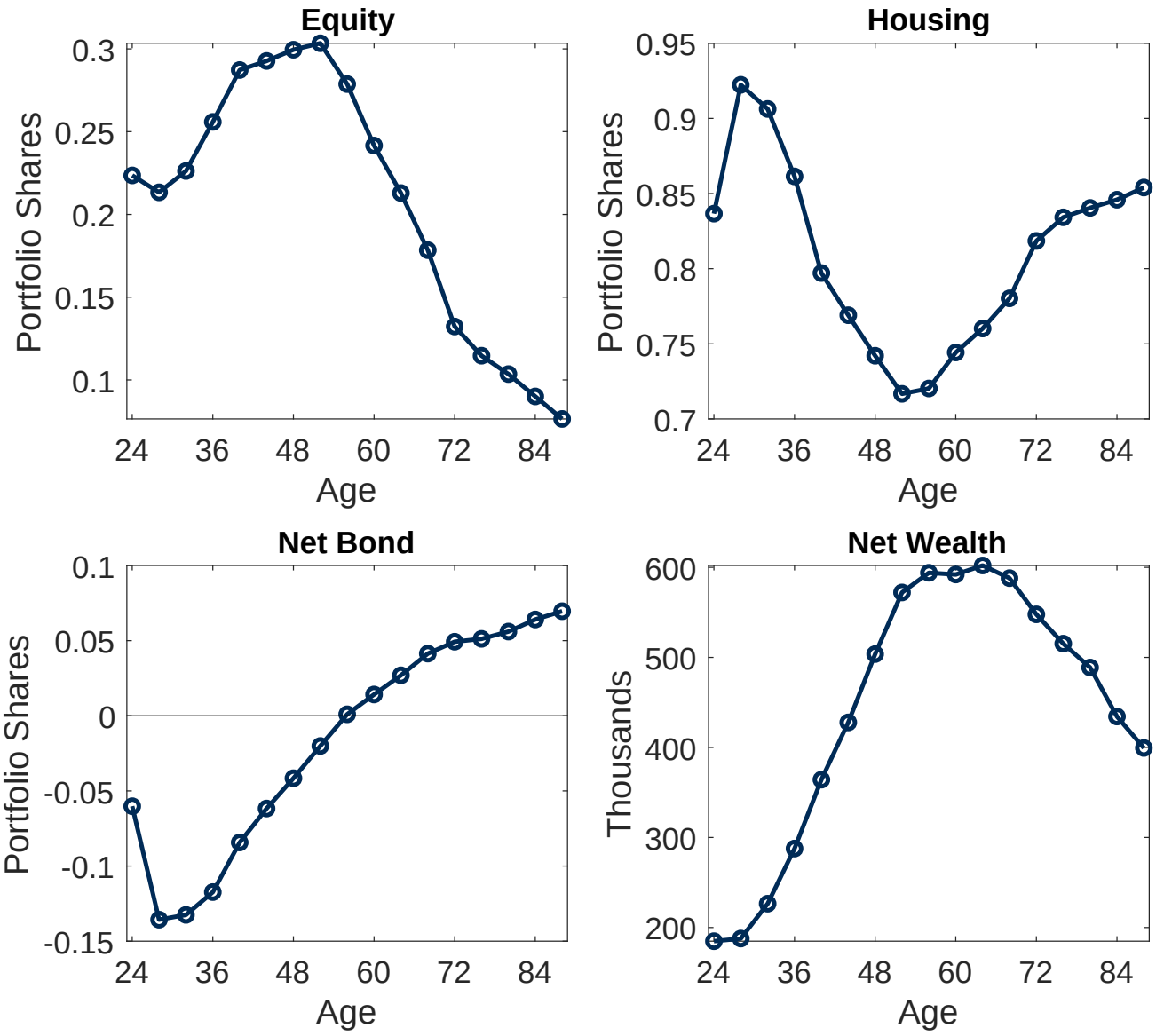
- Households benefit from the increase in risky asset prices
- And increase their consumption
- Young households tend to react more

Work-in-Progress

- Incorporate mortgage-to-income constraints
- Investigate portfolio share changes in later waves

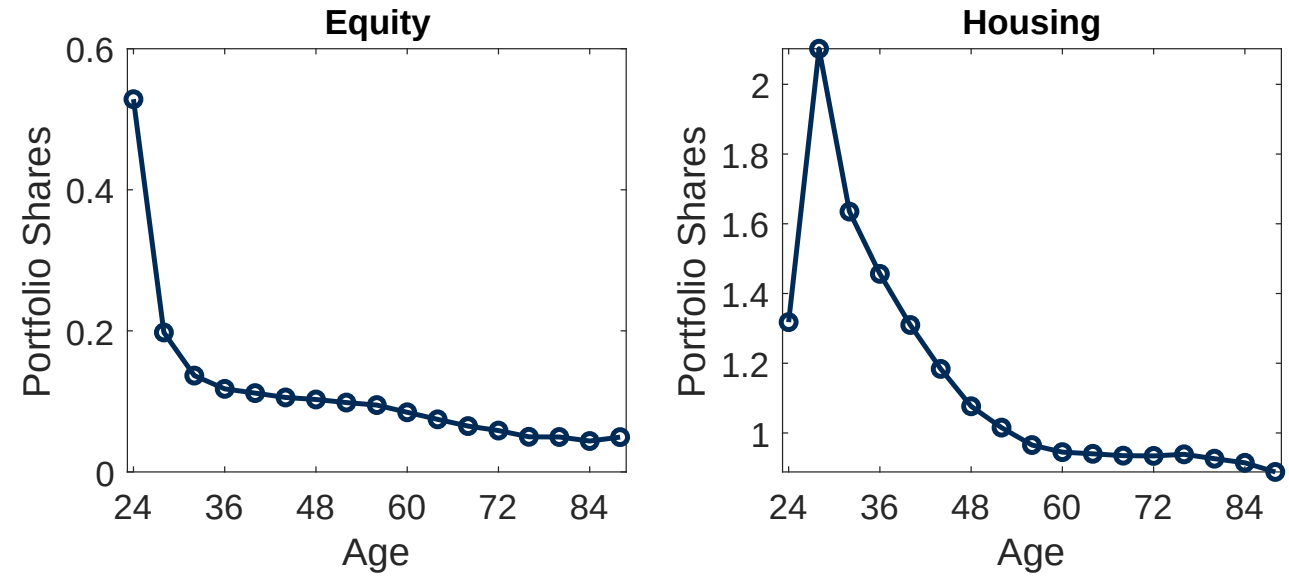
Appendix

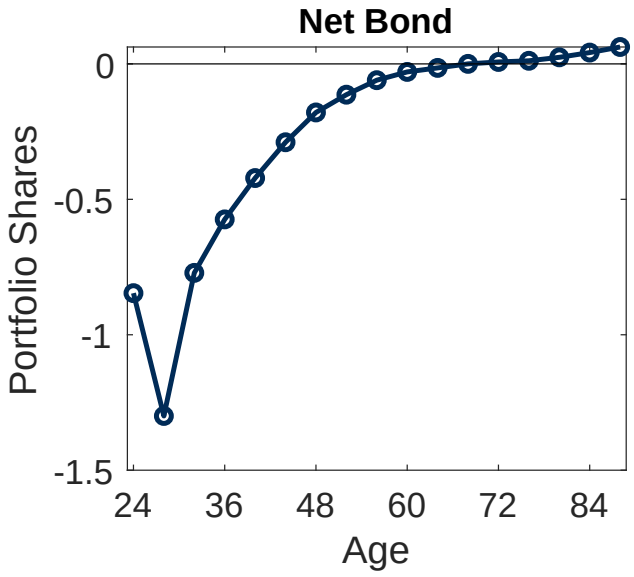
Portfolio shares: Top 20

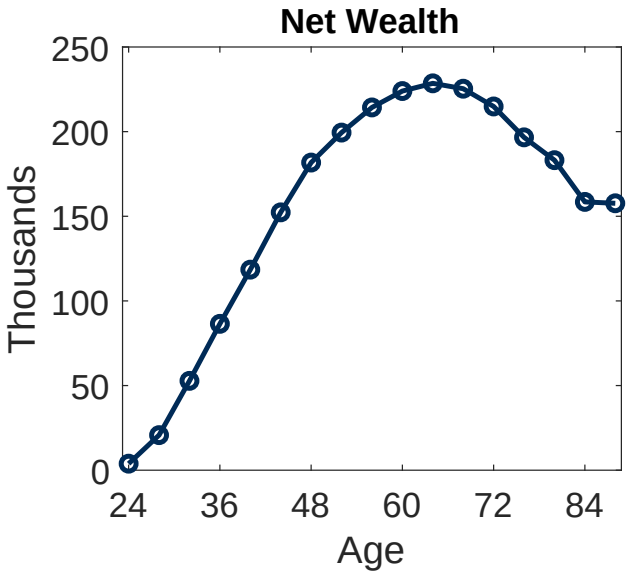


Portfolio share

Portfolio shares: Middle 40

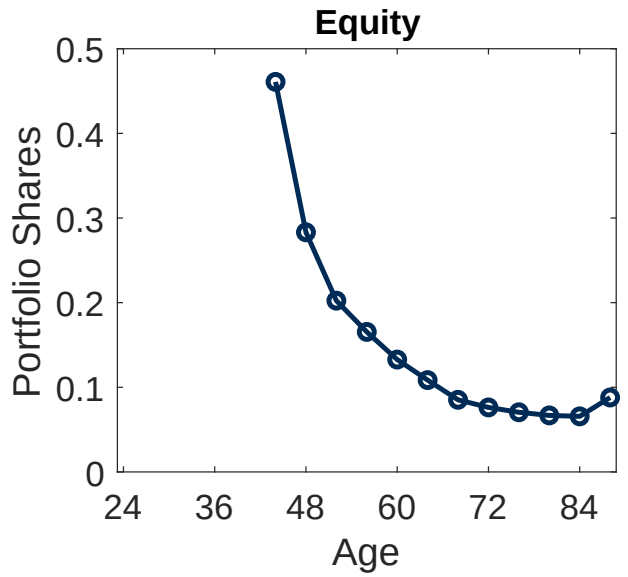


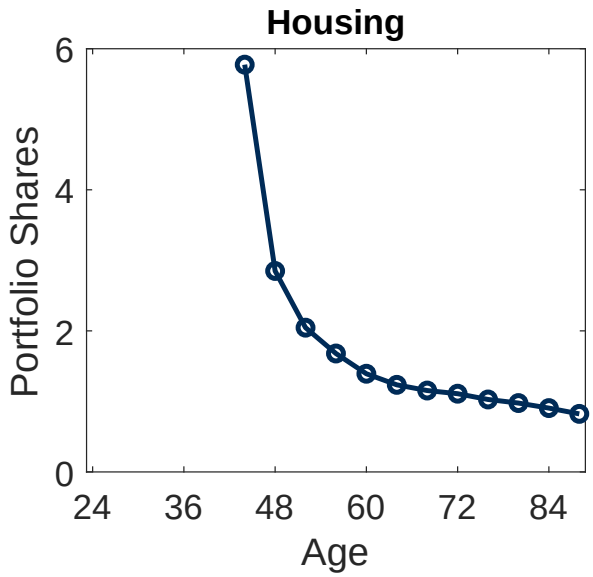


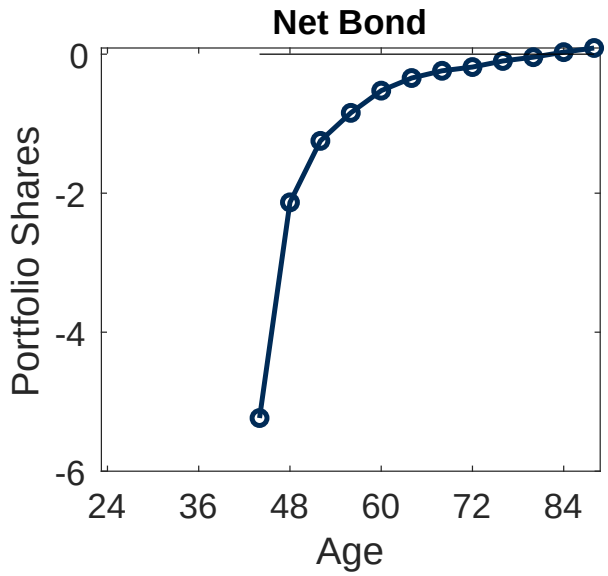


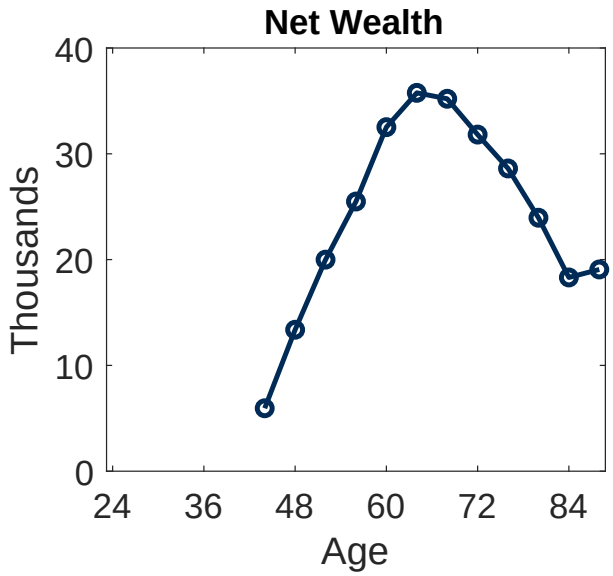
Portfolio share

Portfolio shares: Bottom 40









Calibration

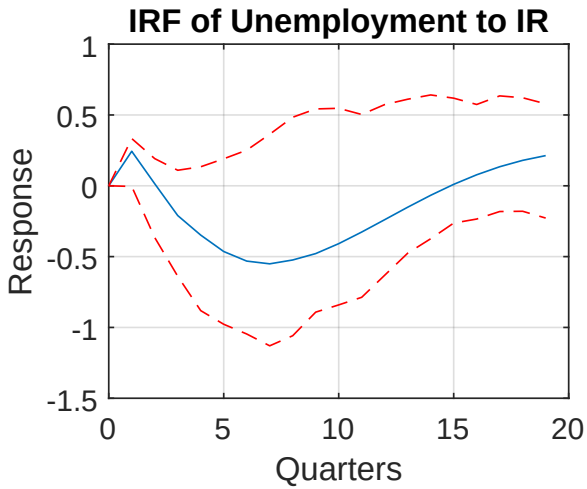
Parameters

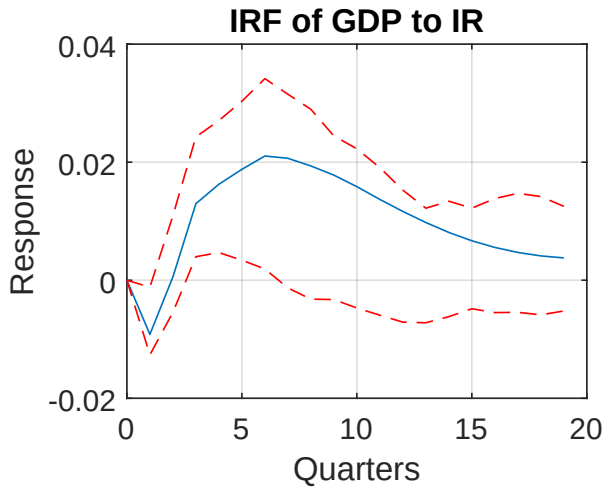
Calibrated Parameters		Financial Assets		Other	
γ	11	μ^B	-0.04%	σ_u^2	2%
σ	0.7	μ^H	1.23%	σ_n^2	1%
f^E	1.8	μ^E	4.89%	ϕ	0.9
f^H	5.8	σ^B	0.89%	β	exp(-0.01*4)
ρ_{sp}	3.25%	σ^H	1.80%		
ϕ_B	1	σ^E	21.39%		

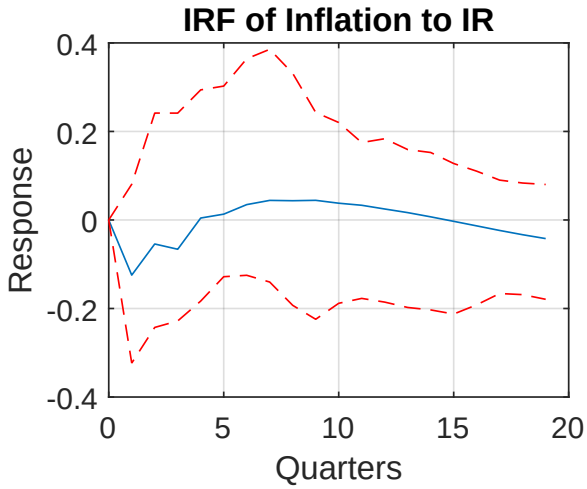
Model Vs Data Main

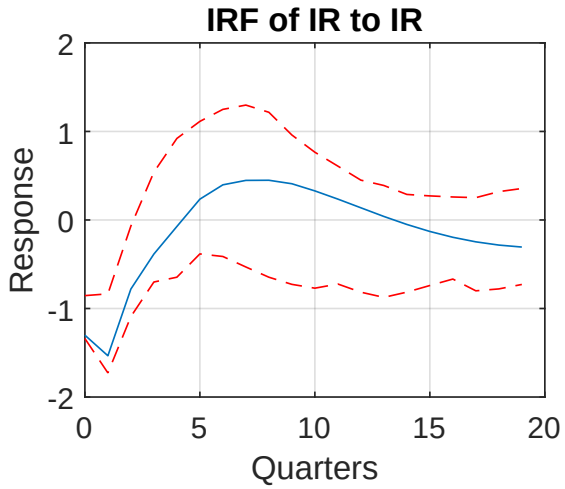
	Wealth/GDP	Housing/GDP	Equity/GDP	Lending/GDP	Borrowing/GDP
data	1.76	1.11	0.19	0.02	−0.13
model	1.76	1.12	0.19	0.03	−0.14

VAR Results









Main

Wealth effects

Wealth Effect

$$\Delta \bar{W}_{i,0^+} = (\underbrace{\bar{p}^E_{0^+}}_{\text{New E Price}} - p^E_0)\theta^E_0 + (\underbrace{\bar{p}^H_{0^+}}_{\text{New H Price}} - p^H_0)\theta^H_0$$

Results