Temptation and Commitment:

A Model of Hand-to-Mouth Behvior

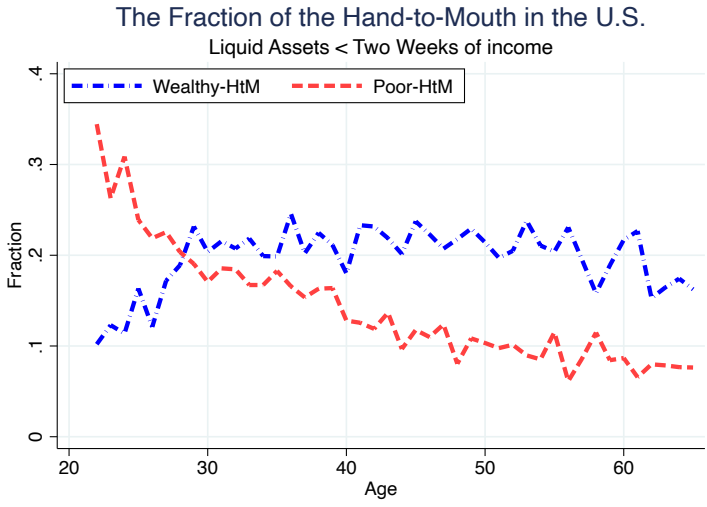
Orazio Attanasio
Yale University, IFS & NBER

Agnes Kovacs
King's College London & IFS

Patrick Moran
Federal Reserve Board & IFS

2024

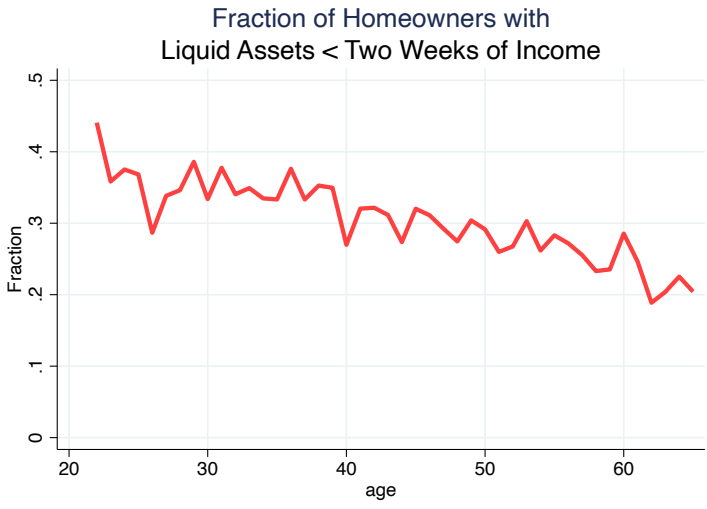
Motivation:



Source: Kaplan, Violante and Weidner (2014) based on the U.S. SCF 1999 - 2015.

By Year By Country

Motivation:



Source: Own calculations based on the U.S. SCF 1999 - 2015.

Motivation

Why is there a strong preference for illiquid housing?

- It prevents consumption smoothing over income shocks
- It appears paradoxical given the existence of a high return liquid asset

Motivation

Why is there a strong preference for illiquid housing?

- It prevents consumption smoothing over income shocks
- It appears paradoxical given the existence of a high return liquid asset

Traditional explanations

- Collateral role of housing
- Utility role of housing (taste)
- **Investment role of housing** (Kaplan and Violante, 2014)

Motivation

Why is there a strong preference for illiquid housing?

- It prevents consumption smoothing over income shocks
- It appears paradoxical given the existence of a high return liquid asset

Traditional explanations

- Collateral role of housing
- Utility role of housing (taste)
- **Investment role of housing** (Kaplan and Violante, 2014)

We focus on: commitment role of housing

- Difficult to save in liquid assets because of self-control problems
- Illiquid housing may act as a savings commitment device

What we Do

- Develop a new model of consumption and savings
  - Households might face the urge for instant gratification, that it costly to resist (temptation)
  - Households might reduce temptation by locking wealth in illiquid housing (commitment)

What we Do

- Develop a new model of consumption and savings
  - Households might face the urge for instant gratification, that it costly to resist (temptation)
  - Households might reduce temptation by locking wealth in illiquid housing (commitment)

- Estimate the model to match life cycle patterns in the PSID and the SCF
  - Target income, consumption, liquid wealth, housing wealth, HtM status, etc.
  - Jointly estimate the degree of temptation and taste for housing

What we Do

- Develop a new model of consumption and savings
  - Households might face the urge for instant gratification, that it costly to resist (temptation)
  - Households might reduce temptation by locking wealth in illiquid housing (commitment)

- Estimate the model to match life cycle patterns in the PSID and the SCF
  - Target income, consumption, liquid wealth, housing wealth, HtM status, etc.
  - Jointly estimate the degree of temptation and taste for housing

- Evaluate the importance of illiquidity on consumption dynamics
  - How do households respond to an unexpected income shock?
  - How effective is targeted fiscal stimulus?

Main Findings

1. Key model implications
    - The commitment benefit generates demand for additional housing
    - No need for excess return on housing to generate Wealthy-HtM

Main Findings

1. Key model implications
   - The commitment benefit generates demand for additional housing
   - No need for excess return on housing to generate Wealthy-HtM

2. Model obtains a good fit of the empirical evidence
   - Matches evidence that a large share households are HtM
   - Life cycle patterns of wealth accumulation cannot be matched using housing utility alone

Main Findings

1. Key model implications
   - The commitment benefit generates demand for additional housing
   - No need for excess return on housing to generate Wealthy-HtM

2. Model obtains a good fit of the empirical evidence
   - Matches evidence that a large share households are HtM
   - Life cycle patterns of wealth accumulation cannot be matched using housing utility alone

3. Model generates realistic consumption behavior
   - High average MPCs
   - MPCs only decline slowly both with shock size and net wealth
   - Large, targeted stimulus payments are effective in boosting consumption

Model

Model

Life cycle model of consumption and savings

Model

Life cycle model of consumption and savings

Novel features

- Temptation preferences make it costly to hold liquid assets
- A commitment device (housing) can reduce temptation

Temptation and Commitment

Standard preferences

- Feasible alternative that is not chosen don't impact utility
- Households are committed to their choices
- No need for commitment

Temptation and Commitment

Standard preferences

- Feasible alternative that is not chosen don't impact utility
- Households are committed to their choices
- No need for commitment

Temptation preferences (Gul and Pesendorfer, 2001 and 2004) Axioms

- Feasible alternative that is not chosen can impact utility
- Temptation: to optimize only for today rather than for a lifetime
- Need for commitment: to reduce temptation by restricting choice set today

Preferences

$$\max_{\{c_t, h_t\}_{t=0,..,T}} \mathbb{E}_0 \sum_{t=0}^{T} \beta^t U(c_t, h_t, \tilde{c}_t, \tilde{h}_t)$$

- c_t : nondurable consumption
- h_t : housing status
- $\tilde{c}_t$: most tempting consumption
- $\tilde{h}_t$: most tempting housing status

Preferences

$$\max_{\{c_t, h_t\}_{t=0,..,T}} \mathbb{E}_0 \sum_{t=0}^{T} \beta^t U(c_t, h_t, \tilde{c}_t, \tilde{h}_t)$$

- c_t : nondurable consumption
- h_t : housing status
- $\tilde{c}_t$: most tempting consumption
- $\tilde{h}_t$: most tempting housing status

$$U(c_t, h_t, \tilde{c}_t, \tilde{h}_t) = u(c_t, h_t) - \underbrace{\lambda\Big[u(\tilde{c}_t, \tilde{h}_t) - u(c_t, h_t)\Big]}_{\text{utility cost of self-control}}$$

- λ: degree of temptation

Preferences

$$\max_{\{c_t, h_t\}_{t=0,..,T}} \mathbb{E}_0 \sum_{t=0}^{T} \beta^t U(c_t, h_t, \tilde{c}_t, \tilde{h}_t)$$

- c_t : nondurable consumption
- h_t : housing status
- $\tilde{c}_t$: most tempting consumption
- $\tilde{h}_t$: most tempting housing status

$$U(c_t, h_t, \tilde{c}_t, \tilde{h}_t) = u(c_t, h_t) - \underbrace{\lambda\Big[u(\tilde{c}_t, \tilde{h}_t) - u(c_t, h_t)\Big]}_{\text{utility cost of self-control}}$$

- λ: degree of temptation

Most tempting alternative: maximize current period felicity

$$\Big[\tilde{c}_t, \tilde{h}_t\Big] = \arg \max_{c_t, h_t \in \mathscr{A}_t} u(c_t, h_t)$$

Preferences

Functional form follows Attanasio et al (2012)

$$u(c_t, h_t) = \underbrace{\frac{c_t^{1-\gamma}}{1-\gamma}}_{\text{consumption utility}} \underbrace{e^{\theta\phi(h_t)}}_{\text{multip housing utility}} + \underbrace{\mu\phi(h_t)}_{\text{additive housing utility}} - \underbrace{\kappa\mathbb{I}_{h_t \neq h_{t-1}}}_{\text{utility cost of moving}}$$

- γ: coefficient of relative risk aversion
- θ and μ: housing preference parameters
- ϕ: relative utility of house choice h_t
- κ: utility cost of housing adjustment (only applies if $h_t \neq h_{t-1}$)

Assets and Mortgages

1. Liquid asset (a_t)
    - Certain return, r

Assets and Mortgages

1. Liquid asset (a_t)
   - Certain return, r

2. Illiquid housing asset (h_t)
   - Discrete asset with N different sizes (rental, flat, house, mansion, etc)
   - Certain return, r^H
   - Transaction costs: fraction F of the house price and utility cost κ
   - Transaction costs generate commitment benefit

Assets and Mortgages

1. Liquid asset (a_t)
   - Certain return, r

2. Illiquid housing asset (h_t)
   - Discrete asset with N different sizes (rental, flat, house, mansion, etc)
   - Certain return, r^H
   - Transaction costs: fraction F of the house price and utility cost κ
   - Transaction costs generate commitment benefit

3. Mortgages (m_t)
   - Minimum downpayment of ψ percent of the house price
   - Fixed-rate mortgage, r^M
   - Fixed repayment each period until retirement or house sale

Model Estimation

Calibration

- Set standard parameters based on existing literature

Calibration

- Set standard parameters based on existing literature
- Set return to liquid assets and housing from U.S. data
  - $r = 5.40\%$, $r^H = 2.53\%$ and $r^M = 4.10\%$

	Mean	St.Dev.	Risk-adj. Return
Stock	8.24	16.82	5.40
Housing	2.79	5.06	2.53

Real Asset Returns

Calibration

- Set standard parameters based on existing literature
- Set return to liquid assets and housing from U.S. data
  - $r = 5.40\%$, $r^H = 2.53\%$ and $r^M = 4.10\%$

	Mean	St.Dev.	Risk-adj. Return
Stock	8.24	16.82	5.40
Housing	2.79	5.06	2.53

Real Asset Returns

"It would be perhaps smarter, if wealth accumulation is your goal, to rent and put money in the stock market, which has historically shown much higher returns than the housing market." - Robert Shiller

Estimation

- There remain six parameters to estimate, Γ:
  - Temptation (λ)
  - Impatience (β)
  - Utility Cost of Moving (κ)
  - Housing Utility Additive (μ)
  - Housing Utility Multiplicative (θ)
  - Risk Aversion (γ)

Estimation

- There remain six parameters to estimate, Γ:
  - Temptation (λ)
  - Impatience (β)
  - Utility Cost of Moving (κ)
  - Housing Utility Additive (μ)
  - Housing Utility Multiplicative (θ)
  - Risk Aversion (γ)

- Estimation performed by matching life cycle profiles and aggregate moments from the PSID and the SCF, using the Simulated Method of Moments

Estimation

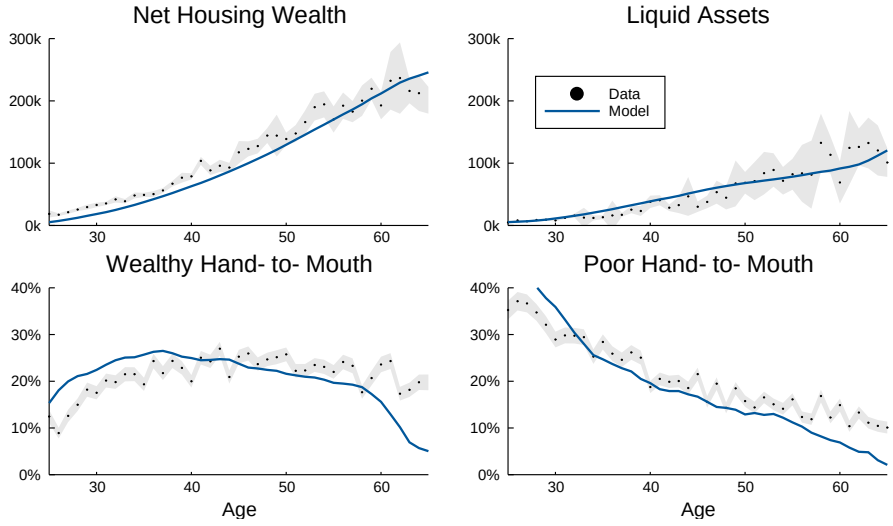
- There remain six parameters to estimate, Γ:
  - Temptation (λ)
  - Impatience (β)
  - Utility Cost of Moving (κ)
  - Housing Utility Additive (μ)
  - Housing Utility Multiplicative (θ)
  - Risk Aversion (γ)

- Estimation performed by matching life cycle profiles and aggregate moments from the PSID and the SCF, using the Simulated Method of Moments

$$\min_{\Gamma} H(\Gamma) V^{-1} H(\Gamma)$$

where vector $H(\Gamma)$ is the difference between the simulated moments and empirical moments. V is a weighting matrix.

Targeted Life-cycle Moments: Temptation Model

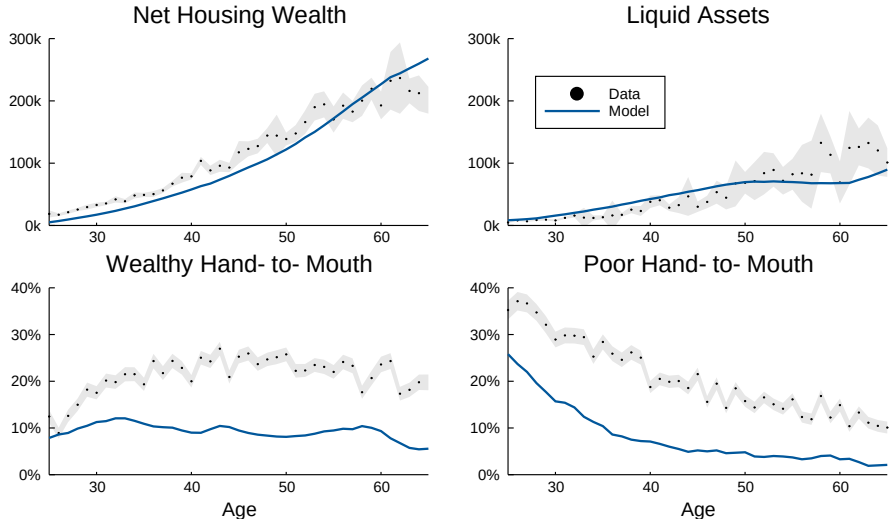


Estimated Parameters:

		Temptation Model	Standard Model
Temptation	λ	0.149	
Impatience	β	0.967	
Utility Cost of Moving	κ	0.899	
Housing Utility Additive	μ	0.249	
Housing Utility Multiplicative	θ	0.002	
Risk Aversion	γ	2.143	

Note: Temptation model allows λ to vary freely. Standard model imposes restriction that $\lambda = 0$. $\theta > 0$ indicates that consumption and housing are complements.

Targeted Life-cycle Moments: Standard Model



Estimated Parameters:

		Temptation Model	Standard Model
Temptation	λ	0.149	-
Time Preference	β	0.967	0.938
Utility Cost of Moving	κ	0.899	0.339
Housing Utility Additive	μ	0.249	0.533
Housing Utility Multiplicative	θ	0.002	0.174
Risk Aversion	γ	2.143	2.379

Note: Temptation model allows λ to vary freely. Standard model imposes restriction that $\lambda = 0$. $\theta > 0$ indicates that consumption and housing are complements.

Policy Implications

Policy Implications

1. What is the consumption response to windfall income shocks?

2. How effective is targeted fiscal stimulus?

MPC Heterogeneity

	SHOCK SIZE		
	$1,000	$5,000	$10,000
Average MPC	0.26	0.20	0.18
Average MPC of the PHtM	0.68	0.52	0.41
Average MPC of the WHtM	0.55	0.41	0.35

MPC Heterogeneity by Shock Size and HtM Type

MPC Heterogeneity

	SHOCK SIZE		
	$1,000	$5,000	$10,000
Average MPC	0.26	0.20	0.18
Average MPC of the PHtM	0.68	0.52	0.41
Average MPC of the WHtM	0.55	0.41	0.35

MPC Heterogeneity by Shock Size and HtM Type

- In our model, MPC declines slowly with shock size
- Consistent with Kueng (QJE, 2018) or Fagereng, Holm, and Natvik (AEJ: Macro, 2021)
- Not consistent with current heterogeneous agent models

Targeted Fiscal Stimulus

Historically, very little stimulus targeting in the U.S.

- The Economic Stimulus Act (ESA) of 2008 gave stimulus payments to approximately 85% of U.S. households

Targeted Fiscal Stimulus

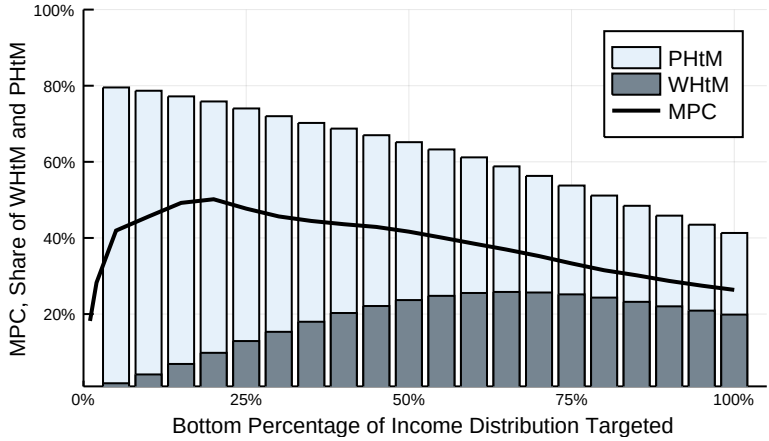
Historically, very little stimulus targeting in the U.S.

- The Economic Stimulus Act (ESA) of 2008 gave stimulus payments to approximately 85% of U.S. households

Would income targeting make fiscal stimulus more effective?

- Model experiment: provide a budget equivalent fiscal stimulus, varying the fraction of the income distribution that receives stimulus payments
- For instance, give $500 to all households or $1,000 to the bottom half of the income distribution

Targeted Fiscal Stimulus



- Substantial gains to targeted stimulus: optimal to target bottom 20%

Conclusion

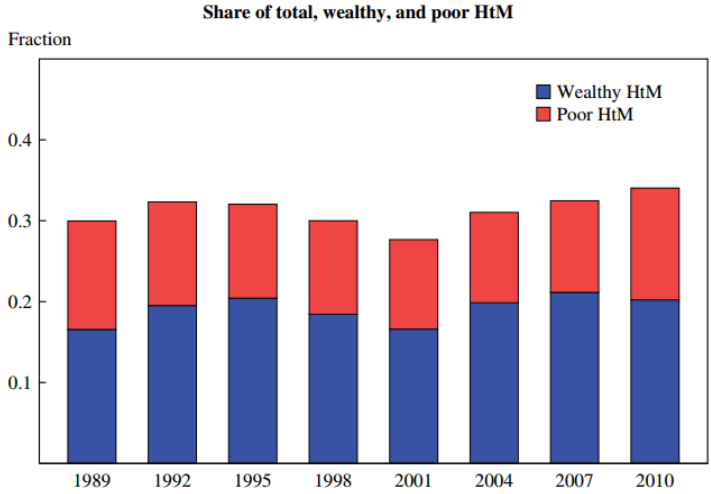
- Temptation and commitment obtain a good fit of the empirical evidence
  - Matches evidence on Hand-to-Mouth behavior
  - Life cycle patterns of wealth accumulation cannot be matched using housing utility alone

Conclusion

- Temptation and commitment obtain a good fit of the empirical evidence
  - Matches evidence on Hand-to-Mouth behavior
  - Life cycle patterns of wealth accumulation cannot be matched using housing utility alone
- Model generates realistic consumption behavior
  - MPCs decline slowly by income shock size
  - Large, targeted fiscal stimulus payments are effective in boosting consumption

Thank you

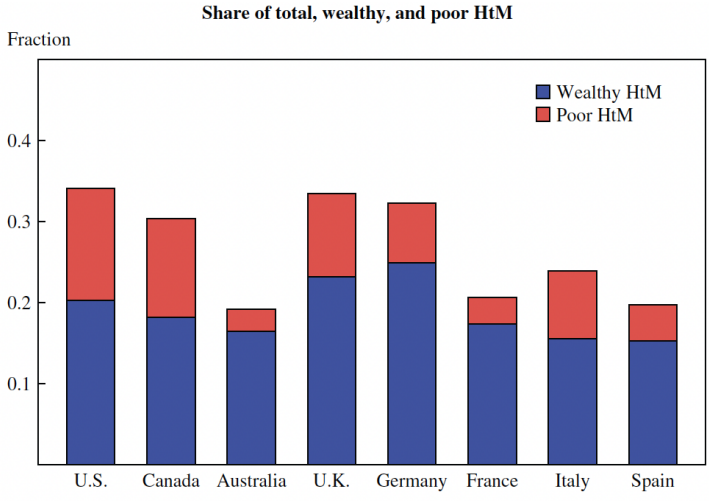
The Share of Hand-to-Mouth Households Over Time



Source: Kaplan, Violante and Weidner (2014) based on the U.S. SCF 1999 - 2015.

Back

The Share of Hand-to-Mouth Households In Different Countries



Source: Kaplan, Violante and Weidner (2014) based on the U.S. SCF 1999 - 2015.

Back

The Model of Temptation by Gul and Pesendorfer (2001)

Characterise form of temptation preferences based on 4 axioms

AXIOM 1 (Preference Relation): $\succeq$ is a complete and transitive binary relation

AXIOM 2 (Strong Continuity): The sets $\{B : B \succeq A\}$ and $\{B : A \succeq B\}$ are closed

AXIOM 3 (Independence): $A \succ B$ and $\alpha \in (0, 1)$ implies $\alpha A + (1 - \alpha)C \succ \alpha B + (1 - \alpha)C$

AXIOM 4 (Set Betwenness): $A \succeq B$ implies $A \succeq A \cup B \succeq B$

Back

Income Process

$$lny_t = g_t + z_t$$

- g: Deterministic age profile for income (third order polynomial)
- z: Idiosyncratic income process
  - Exogenous AR(1) process

$$z_t = \rho z_{t-1} + \varepsilon_t$$
$$\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$$
$$z_0 \sim N(0, \sigma_0^2)$$

Additional Model Features

Necessary so that the model has a chance at fitting the data:

- Exogenously arriving kids that enter the utility function — Kids
- Progressive income taxation — Taxes
- Housing subsidy through the mortgage interest tax deduction — MITD
- Progressive social security style pension in retirement — Pensions

Budget Constraint | Mortgage Details

Housing Preferences with Kids

An equivalence scale n_t captures the evolution of household composition

$$u(c_t, h_t, n_t) = n_t \left(\underbrace{\frac{\left(\frac{c_t}{n_t}\right)^{1-\gamma}}{1-\gamma}}_{\text{consumption utility}} \underbrace{e^{\theta\phi(h_t,n_t)}}_{\text{multip housing utility}} + \underbrace{\mu\phi(h_t, n_t)}_{\text{additive housing utility}} - \underbrace{\chi \mathbb{I}_{h_t \neq h_{t-1}}}_{\text{utility cost of moving}} \right)$$

$$\phi(h_t, n_t) = \frac{\left(\frac{h_t}{n_t}\right)^{1-\alpha}}{1-\alpha}$$

Back

Income Taxation

Progressive Income Taxation following Keane and Wasi (2016)

- After tax income given by $\widetilde{y_t} = y_t - \tau(y_t)$
- Nonlinear tax function

$$\tau(y_t) = e^{\tau_1 + \tau_2 \log(y_t - \tau_d)}$$

  where τ_1 and τ_2 are estimated on CPS data and τ_d is the deduction

- $\tau_d = \max\Big[\text{Mortgage Interest Tax Deduction}, \quad \text{Standard Deduction}\Big]$

Back

Social Security

Following retirement at age $\overline{T}$, households receive income

$$\widetilde{y}_t = \max\left\{\text{SS Income Floor}, \quad \text{Annual PIA}(y_{\overline{T}})\right\} \quad \forall t > \overline{T}$$

- where Annual PIA$(y_{\overline{T}})$ is the annual social security benefit (the primary insurance amount) received upon retirement, based on average indexed monthly earnings (AIME), which we approximate based on last period income $y_{\overline{T}}$
- The PIA is computed as 90% of AIME up to breakpoint 1, 32% of AIME up to breakpoint 2, and 15% of AIME up to the SS wage base
- The SS Income Floor, PIA breakpoints, and SS wage base are taken from 2015

Back

Mortgages

If the household buys a new home:

$$m_{t+1} = (1 - \psi) P_t(h_t)(1 + r^M)$$

Mortgages

If the household buys a new home:

$$m_{t+1} = (1-\psi)P_t(h_t)(1+r^M)$$

If the household stays in the same home:

$$m_{t+1} = (m_t - mp_t)(1+r^M)$$

- Where mortgage repayments are given by:

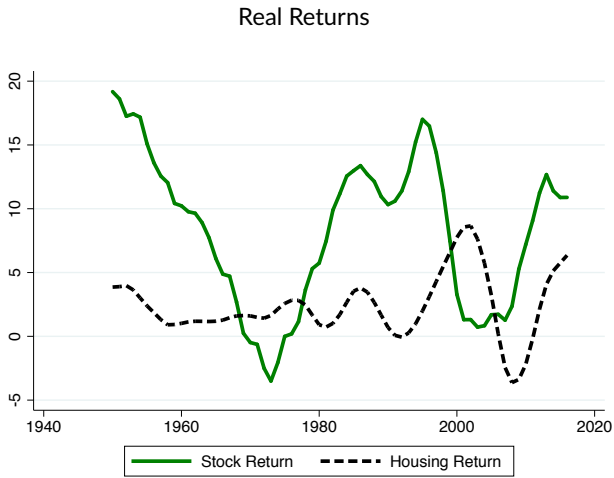
$$mp_t = \frac{(1+r^M)^k}{\sum_{j=1}^{k}(1+r^M)^j} m_t$$

- Where $k = \overline{T} - t + 1$ is the number of periods until retirement

Back

Calibration

Housing has lower returns than stocks



10-year Moving Average, two sided. Annual Data

Heterogeneity in initial liquid assets

- Calibrate initial liquid asset distribution to match that in the PSID
- Target moments at age 22
  - fraction of households with zero liquid asset
  - mean log liquid assets, conditional on positive assets
  - standard deviation of log liquid assets, conditional on positive assets

Back

Budget Constraint

If the household stays in the same home:

$$\frac{a_{t+1}}{1+r} = a_t + \widetilde{y}_t - c_t - mp_t$$

If the household continues to rent:

$$\frac{a_{t+1}}{1+r} = a_t + \widetilde{y}_t - c_t - rent_t$$

If the household decides to change homes:

$$\frac{a_{t+1}}{1+r} = a_t + \widetilde{y}_t - c_t - \underbrace{\left[(1+F)P_t(h_t) - \frac{m_{t+1}}{(1+r^M)}\right]}_{\text{home equity from purchase}} + \underbrace{\left[(1-F)P_t(h_{t-1}) - m_t\right]}_{\text{home equity from sale}}$$

Real Asset Returns

	Mean	St.Dev.	Risk-adj. Mean
T-Bill	0.74	2.12	0.69
Stock (S&P 500)	8.24	16.82	5.40
Housing (Case-Shiller)	2.79	5.06	2.53

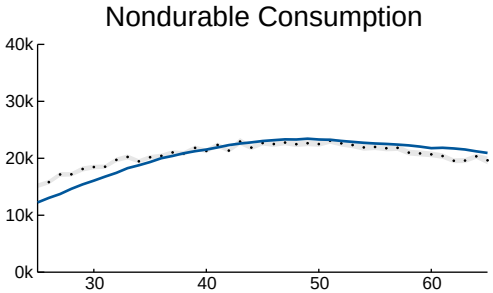
Back

Fixed Annual Parameters

Parameter		Value
ρ	income persistence	0.90
σ	std. dev. income shock	0.05
η	rental scale	0.03
R^H	housing return	1.02
R	stock return	1.05
R^M	mortgage rate	1.04
ψ	minimum down-payment	0.10
F	fixed cost of moving	0.05

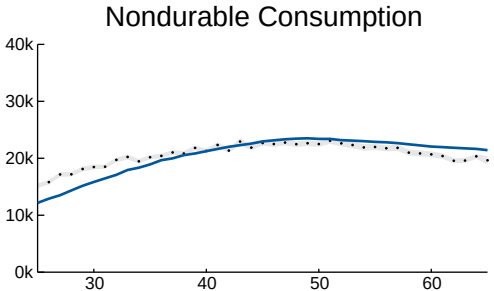
Back

Consumption: Temptation Model



Back

Consumption: Standard Model



Back

Targeted Aggregate Moments

Targeted Aggregate Moments

	Data	Temptation Model	Standard Model
Homeownership rate	0.65	0.69	0.76
Share of movers	0.068	0.041	0.074

Note: The share of movers represents the share of homeowners that move for non-work reasons.

Back