QUASI-HYPERBOLIC DISCOUNTING

Estimating Discount Functions with Consumption Choices over the Lifecycle

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STRUCTURE

- Use structural lifecycle model to estimate β, δ
- Novel identification - Boundary Analysis
- Public available datasets
- Other related research

SHORT-RUN IMPATIENCE VS LONG-RUN PATIENCE

What does the data say? From the Survey of Consumer Finances, we observe

- A lot of people borrow from credit cards - very expensive, 11%
- Also, people tend to accumulate wealth - at a lower rate, 5%

Exponential or Quasi-Hyperbolic?

LIFECYCLE MODEL - LAW OF MOTIONS

Liquid asset:

$$X_{t+1} = R^X (X_t + I_t^X)$$

Iliquid asset:

$$Z_{t+1} = R^Z (Z_t + I_t^Z)$$

Flow of consumption:

$$C_t = Y_t - I_t^X - I_t^Z + \kappa_t \min(I_t^Z, 0)$$

State variable:

$$\Lambda_t = \{t, X_t + Y_t, Z_t, \zeta_t\}$$

LIFECYCLE MODEL - UTILITY

CRRA Utility function:

$$u(C_t, Z_t, n_t) = n_t \cdot \frac{\left(\frac{C_t + \gamma Z_t}{n_t}\right)^{1-\rho} - 1}{1 - \rho}$$

LIFECYCLE MODEL - NAIVETE (SOLVED BY MAXTED (2024))

Naivete Self t has the objective function:

$$\max_{I_t^X, I_t^Z} u(C_t, Z_t, n_t) + \beta\delta\mathbb{E}_t V_{t,t+1}^E(\Lambda_{t+1})$$

Naivete thinks self $t+1$ has $\beta = 1$, i.e.,

$$\max_{I_{t+1}^{X,E}, I_{t+1}^{Z,E}} u(C_{t+1}, Z_{t+1}, n_{t+1}) + \delta\mathbb{E}_{t+1} V_{t+1,t+2}^E\left(\Lambda_{t+2}^E\right)$$

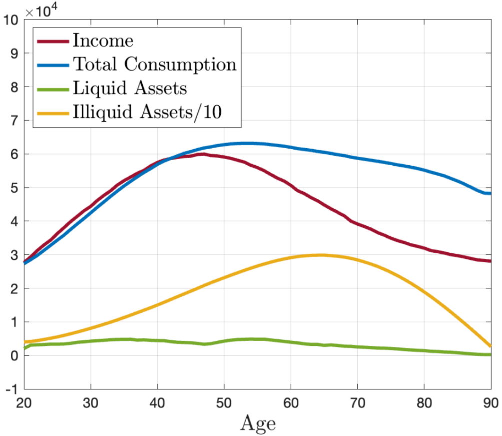
Continuation value function:

$$V_{t-1,t}^E(\Lambda_t) = (1 - \mathbb{1}_t^{death})[u(C_t^E, Z_t, n_t) + \delta\mathbb{E}_t V_{t,t+1}^E(\Lambda_{t+1}^E)] + \mathbb{1}_t^{death} B(\Lambda_t)$$

TWO-STAGE MSM RESULT

ESTIMATION RESULT - $\beta = 1$

Figure 4: Average Lifecycle Profile for Exponential Estimate



This figure plots the average lifecycle profile of income, total consumption, liquid assets, and illiquid assets (divided by ten for scaling) for the benchmark exponential estimate ($\beta = 1$).

ESTIMATION RESULT-$\hat{\beta}$ = 0.53

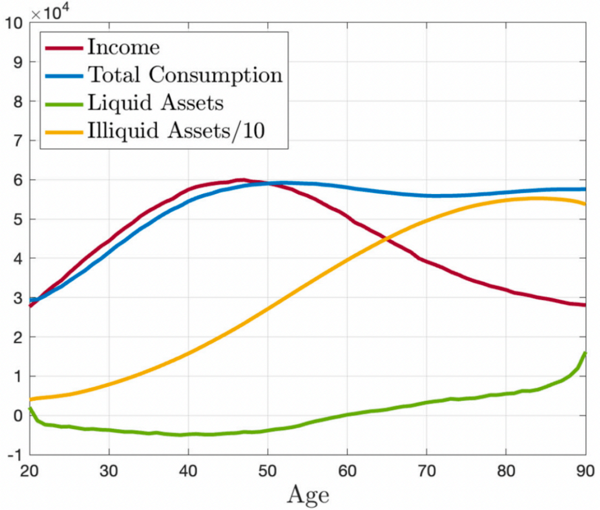


Figure 2
Average lifecycle profile for present-biased estimate
This figure plots the average lifecycle profile of income, total consumption, liquid assets, and illiquid assets (divided by 10 for scaling) for the benchmark estimate ($\hat{\beta}$ = 0.530).

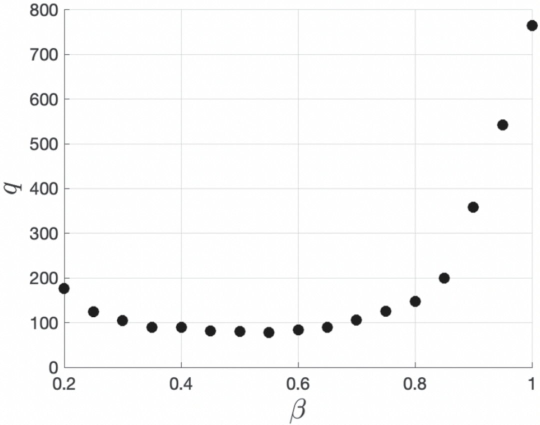


Figure 1
***q* on *β* (allowing *δ* and *ρ* to vary)**
This figure illustrates the sensitivity of the model fit to restrictions on the short-run discount factor β. The vertical axis lists the MSM objective function q. Each point comes from a separate estimate of δ and ρ, conditional on the indicated β.

DATASETS

DATASETS-PART 1

- Consumption: Survey of Consumer Finances (SCF), publically available from https://www.federalreserve.gov/econres/scfindex.htm
- Income: Panel Study of Income Dynamics (PSID), publically available(need registration) from https://simba.isr.umich.edu/Zips/ZipMain.aspx
- Demographics: Integrated Public Use Microdata Series USA (IPUMS USA), publically available(need registration) from https://usa.ipums.org/usaaction/ variables/group

DATASETS-PART 2

- Economics: Federal Reserve Economic Data (FRED), publically available from https://fred.stlouisfed.org/
- Unemployment: Bureau of Labor Statistics (BLS), publically available from https://data.bls.gov/cgibin/ dsrv?la
- Income tax: NBER Taxsim, publically available from https://taxsim.nber.org/to-taxsim/scf27- 32/byhousehold/dta

DATASETS-PART 3

- Historical death probability: Social Security Administration (SSA), publically available from https://www.ssa.gov/oact/HistEst/Death/2023/DeathProbabilities2023.htr
- Bankruptcy: American Bankruptcy Institute (ABI), publically available from https://abiorg. s3.amazonaws.com/Newsroom/Bankruptcy Statistics/Total-Business- Consumer1980-Present.pdf.

OTHER RELATED RESEARCH

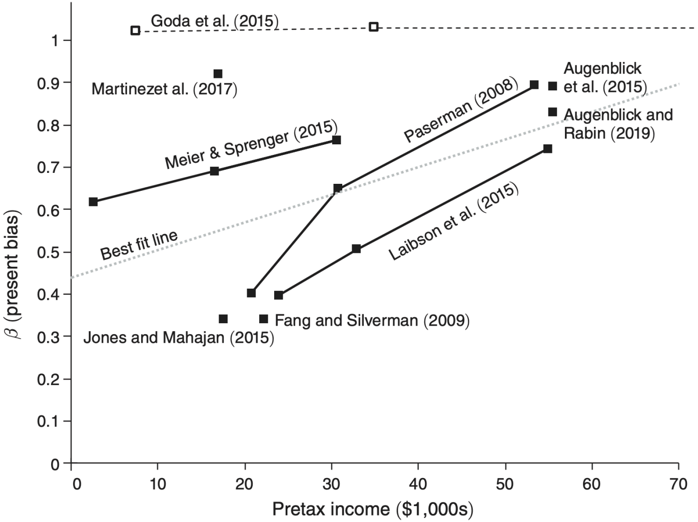


FIGURE 2. ESTIMATED RELATIONSHIP BETWEEN INCOME AND PRESENT-BIAS PARAMETER β

Notes: This figure plots estimates of β across income from several papers. The dotted "best fit line" is used in simulations for the schedule of present bias across the skill distribution. See online Appendix D for details.