YOLO:

Mortality Beliefs and Household Finance Puzzles

R. Heimer, K. Myrseth, and R. Schoenle

FRB-CLE, St Andrews, Brandeis

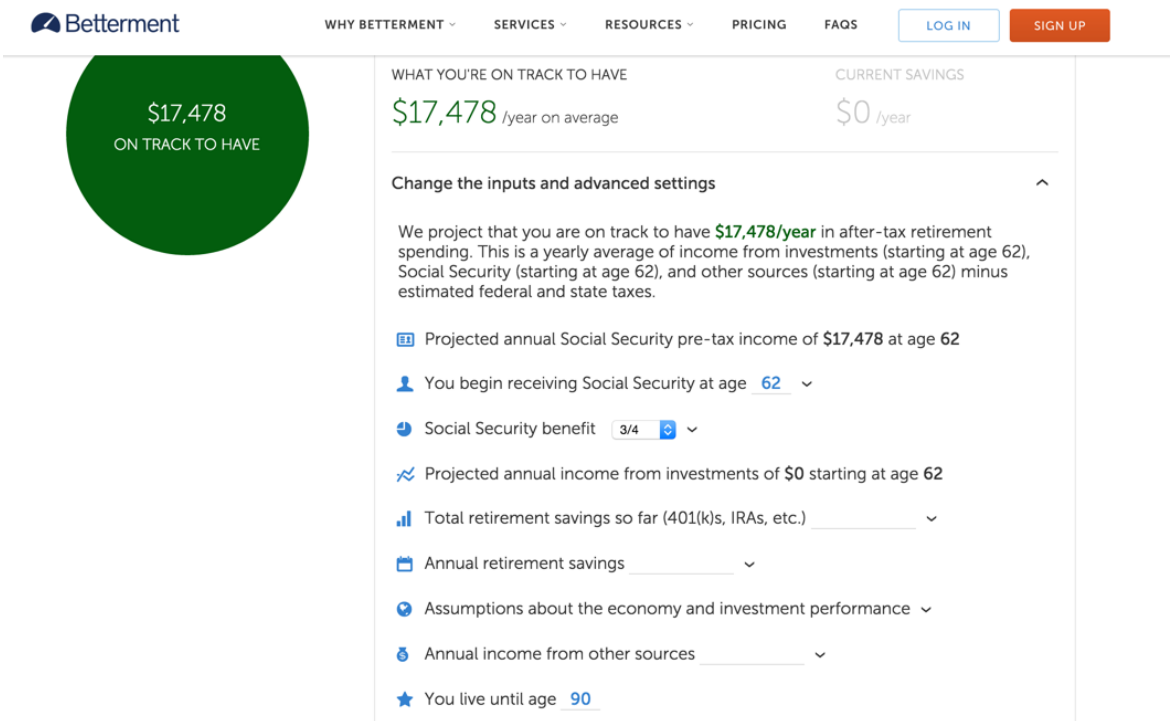
FRB-CLE Household Economics Conference, September 2015

Motivation

- Subjective expectations matter ... a lot
- Use surveyed beliefs to understand shortcomings of classical models. Two examples:
  - Greenwood and Shleifer (2014): household forecasts of returns are systematically biased, reject RE hypothesis, explains asset prices
  - Coibion, Gorodnichenko, and Kumar (2015): firm managers (New Zealand) systematically overshoot expected inflation despite 25 years of inflation targeting

Why do subjective survival beliefs matter?

- Measure subjective life-expectancies (SLE): Beliefs about likelihood of survival to and beyond a given age
- Why do SLEs matter? In practice...



Why do subjective survival beliefs matter?

- Why do subjective survival beliefs matter?
- Mortality beliefs, $\mathrm{E}_t\left[s_{t+1}\right]$, affect inter-temporal trade-off between today's consumption and discounted future consumption streams
- Theory: $V_t^*(\cdot) = \underset{C_t}{max}\{u(C_t) + \beta \mathbf{E_t}[s_{t+1} V_{t+1}^*(\cdot)]\}$

Survival beliefs, their origins and implications

- **New survey evidence on SLEs**: distribution is heavy-tailed compared to actuarial data
  - young overestimate likelihood of dying young, e.g. 28 year-olds make 1-year ahead forecast errors = 5 - 10 ppt
  - old overestimate likelihood of surviving to very old age, e.g. 68 year-olds make a 10 ppt 10-year ahead forecast error
- **Theoretical mechanism for distorted beliefs**: stereotypes about cause-of-death across cohorts
  - young die in rare events, we overweight Pr(tail events)
  - old die of bad health, old survivors are optimistic
- **Distorted beliefs correlate with financial behavior:**
  - save less and may rely on credit cards
  - less experience investing
  - lower financial literacy

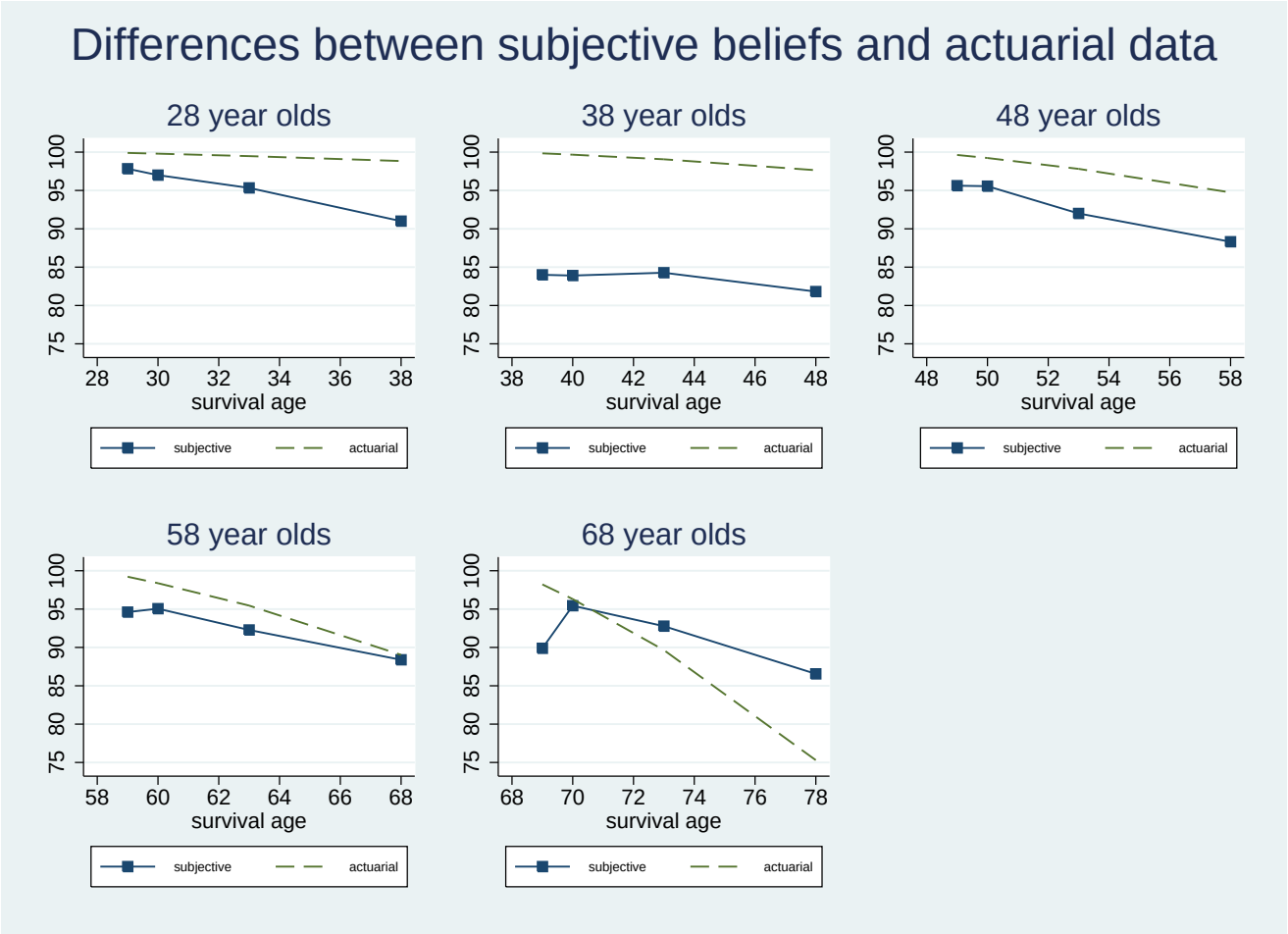
Quantitative importance of biased survival beliefs

- **Mortality beliefs are quantitatively important**: analyze their implications in a run-of-the mill life-cycle model
  1. young people save too little, consume too much
     - Skinner (2007): not enough retirement savings
     - Laibson (1997): rely on credit cards month-to-month, hand-to-mouth consumption
  2. retirees do not fully draw down their assets
     - Porteba et al. (2011): explanations for bequests incomplete
  3. require high equity premium to compensate for overestimation of rare events ($\sim$ certainty equivalence)
     - Mehra and Prescott (1985): EP too high given reasonable ρ
- Takeaway: SLEs explain seemingly unconnected puzzles
  - better data $\uparrow$ life-cycle model's explanatory power
  - previous explanations for puzzles are often contradictory

Survey description

- Qualtrics Panels
  - 400 U.S. respondents (wave 2 will have 1000+)
  - uniformly distributed across ages 28, 38, 48, 58, 68
- Survival likelihood for 1, 2, 5, 10 years
- Complementary questions (off-the-shelf):
  - expected longevity (SCF)
  - confidence in answers
  - financial preference (SCF)
  - financial literacy (Lusardi and Mitchell, 2011)
  - numeracy (Cokely et al., 2012)
  - demographics e.g. income and education

Biased survival beliefs



Biased survival beliefs

Findings are robust to:

- gender
- numerical proficiency
- confidence in responses
- even after we provide respondents w/ mortality statistics!

Where does the bias come from?

Rare events are *vastly* overweighted:

"When you assessed your survival likelihood, to what extent did you place weight on the following risk factors?" (scale of 0 to 100)

variable	mean	median	std dev
The natural course of life and aging ("normal risk")	74.5	80	23.5
Medical conditions (e.g., cancer and heart disease)	69.4	78	26.4
Dietary habits (e.g., unhealthy foods)	62.3	69	28.2
Traffic accidents (e.g., car crash)	45.3	50	29.8
Physical violence (e.g., murder)	35.3	20	32.3
Natural disasters (e.g., earth quakes)	34.7	23	31.5
Animal attacks (e.g., shark attacks)	25.6	9	31.3
Risky lifestyle (e.g., base jumping)	28.3	10	33.3
"Freak events" (e.g., choking on your food)	32.7	23	30.8

$N = 357$

Where does the bias come from?

Overweighting of rare events explains expectation errors:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
risk factor weight	normal risk	medical	diet	traffic accident	violence	natur. disaster	animal attack	risky lifestyle	freak events
SLE error	-0.474	-0.0804	-0.242	0.0366	0.149	0.0971	0.158	0.153	0.203
	(0.094)	(0.063)	(0.055)	(0.040)	(0.021)	(0.078)	(0.043)	(0.047)	(0.050)
age = 38	11.51	1.208	2.658	-5.146	-2.269	-3.214	-1.761	-0.954	-2.036
	(0.61)	(0.25)	(0.50)	(0.24)	(0.37)	(0.26)	(0.20)	(0.60)	(0.38)
age = 48	9.181	5.689	4.995	-2.924	1.692	-3.802	-4.158	-10.08	-0.594
	(0.81)	(0.70)	(0.56)	(0.19)	(0.53)	(0.31)	(0.29)	(0.92)	(0.49)
age = 58	8.116	11.82	7.407	-6.031	-2.774	-7.057	-4.304	-5.147	-2.035
	(0.68)	(0.89)	(0.61)	(0.27)	(0.45)	(0.21)	(0.40)	(0.81)	(0.55)
age = 68	9.296	5.875	10.07	-3.539	0.0678	-4.675	-5.205	-5.552	-6.337
	(1.03)	(0.54)	(0.55)	(0.19)	(0.50)	(0.41)	(0.24)	(1.11)	(0.46)
consecutive questions	x	x	x	x	x	x	x	x	x
education	x	x	x	x	x	x	x	x	x
numeracy	x	x	x	x	x	x	x	x	x
N	357	357	357	357	357	357	357	357	357
R^2	0.078	0.016	0.048	0.016	0.015	0.027	0.027	0.036	0.028

Standard errors in parentheses

Where does the bias come from?

Overweighting of rare events explains expectation errors:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
risk factor weight	normal risk	medical	diet	traffic accident	violence	natur. disaster	animal attack	risky lifestyle	freak events
SLE error	-0.474	-0.0804	-0.242	0.0366	0.149	0.0971	0.158	0.153	0.203
	(0.094)	(0.063)	(0.055)	(0.040)	(0.021)	(0.078)	(0.043)	(0.047)	(0.050)
age = 38	11.51	1.208	2.658	-5.146	-2.269	-3.214	-1.761	-0.954	-2.036
	(0.61)	(0.25)	(0.50)	(0.24)	(0.37)	(0.26)	(0.20)	(0.60)	(0.38)
age = 48	9.181	5.689	4.995	-2.924	1.692	-3.802	-4.158	-10.08	-0.594
	(0.81)	(0.70)	(0.56)	(0.19)	(0.53)	(0.31)	(0.29)	(0.92)	(0.49)
age = 58	8.116	11.82	7.407	-6.031	-2.774	-7.057	-4.304	-5.147	-2.035
	(0.68)	(0.89)	(0.61)	(0.27)	(0.45)	(0.21)	(0.40)	(0.81)	(0.55)
age = 68	9.296	5.875	10.07	-3.539	0.0678	-4.675	-5.205	-5.552	-6.337
	(1.03)	(0.54)	(0.55)	(0.19)	(0.50)	(0.41)	(0.24)	(1.11)	(0.46)
consecutive questions	x	x	x	x	x	x	x	x	x
education	x	x	x	x	x	x	x	x	x
numeracy	x	x	x	x	x	x	x	x	x
N	357	357	357	357	357	357	357	357	357
R^2	0.078	0.016	0.048	0.016	0.015	0.027	0.027	0.036	0.028

Standard errors in parentheses

Do SLEs matter for savings decisions?

- Expectation errors:

$$exp.error_{i,t} = |\mathrm{E}_{i,t}\left[Pr_{i,t}\left(\tau > (t+l)\right)\right] - Pr_{i,t}\left(\tau > (t+l)\right)|$$

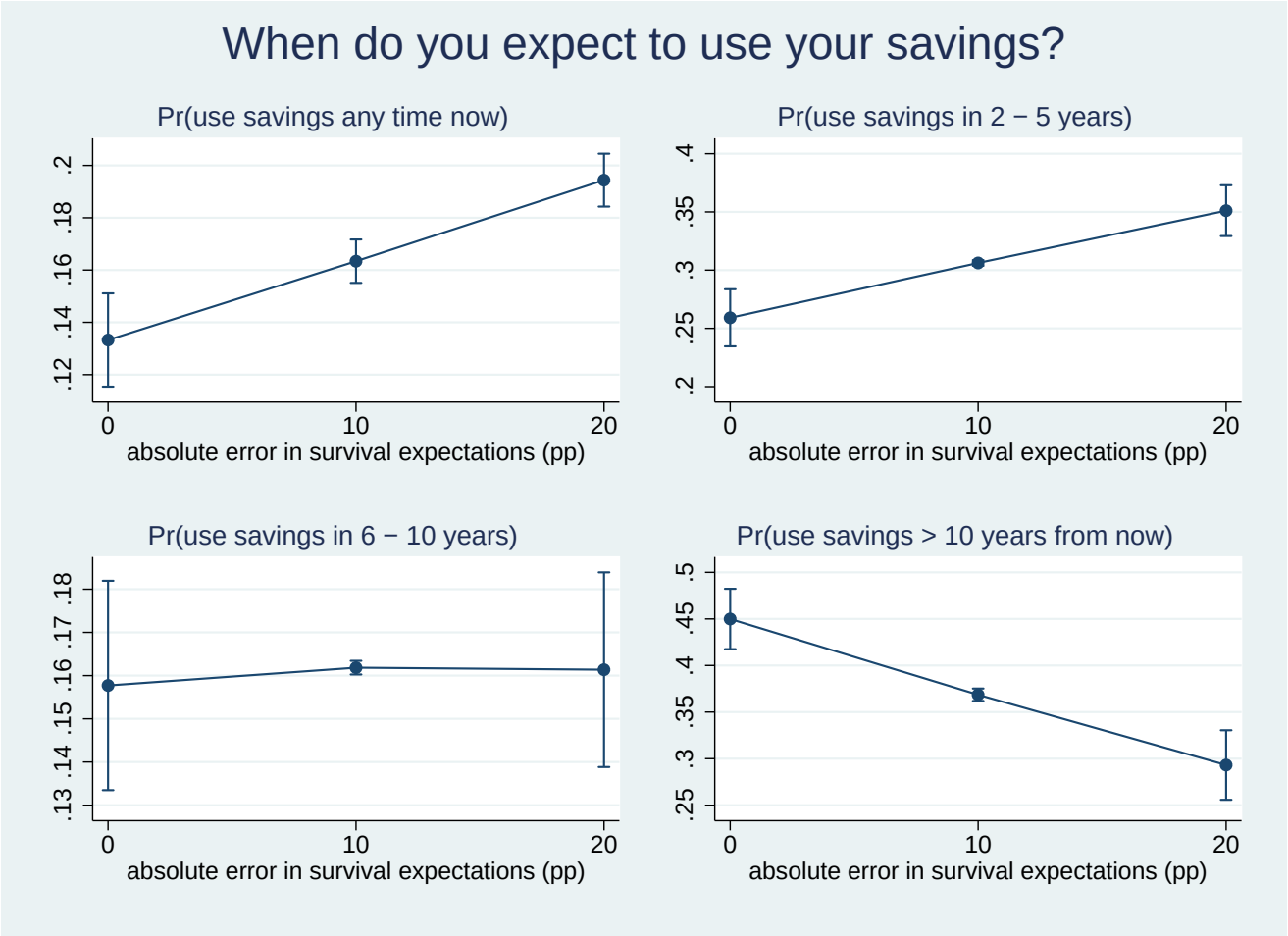
  where $l = \{1, 2, 5, 10\}$

- Multinomial logit model for observation i and outcome k:

$$f(k,i) = \beta_{0k} + \beta_{1k} \cdot exp.error_i + \beta_k X_i$$

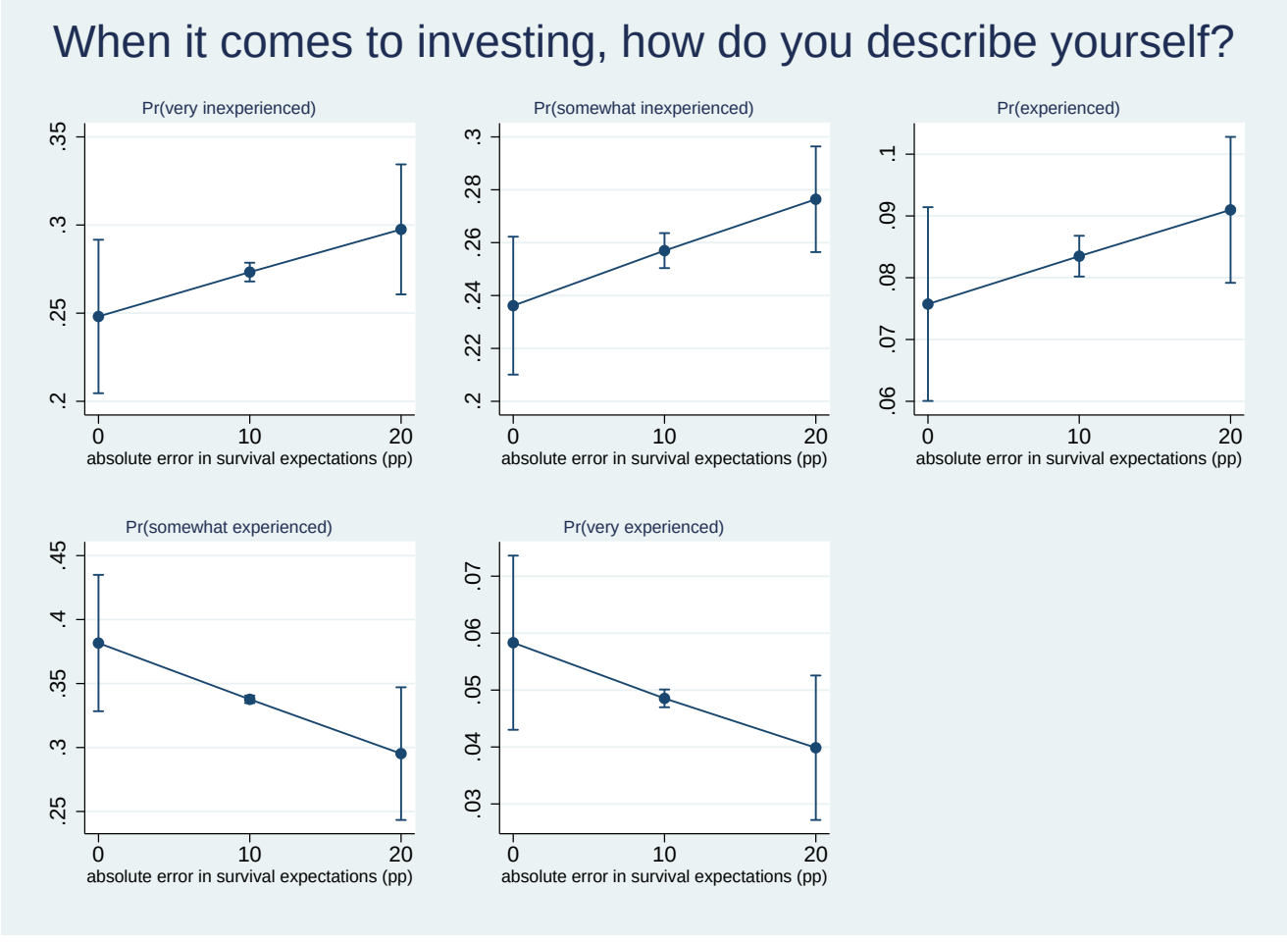
  where X_i includes age, gender, indicators for l, consecutive l, and numeracy.

Do SLEs matter for savings decisions?



Do SLEs matter for savings decisions?

Do SLEs matter for savings decisions?



Do SLEs matter for savings decisions?

financially literate $= 1$ if correctly answer ≥ 2 of following questions: inflation, diversification, and compound interest

financially literate dummy	(1)	(2)	(3)	(4)
SLE error	-0.00586	-0.00595	-0.00595	-0.00518
	(0.0016)	(0.0017)	(0.0015)	(0.0016)
age $= 38$	0.0226	0.0244	0.0238	0.0227
	(0.0084)	(0.0075)	(0.0081)	(0.0084)
age $= 48$	0.187	0.191	0.180	0.186
	(0.012)	(0.0078)	(0.013)	(0.012)
age $= 58$	0.204	0.209	0.196	0.207
	(0.012)	(0.0081)	(0.013)	(0.012)
age $= 68$	0.249	0.256	0.228	0.251
	(0.012)	(0.0096)	(0.039)	(0.012)
consecutive questions		-0.0595		
		(0.093)		
male			0.0503	
			(0.088)	
confident				0.0519
				(0.067)
constant	0.631	0.656	0.613	0.597
	(0.041)	(0.074)	(0.058)	(0.066)
education	x	x	x	x
income	x	x	x	x
survival horizon	x	x	x	x
N	357	357	357	357
R^2	0.062	0.061	0.062	0.062

Standard errors in parentheses

Life-cycle model w/ biased survival beliefs

- Canonical dynamic life-cycle model w/ precautionary savings
  - Carroll (2011), Love (2013)

Key features of life-cycle model:

- Agents choose in discrete time $t = 0, 1, 2, 3, \ldots T_{retire}, \ldots, T$
  - consumption and portfolio share ϕ_t
- Recursive maximization problem:

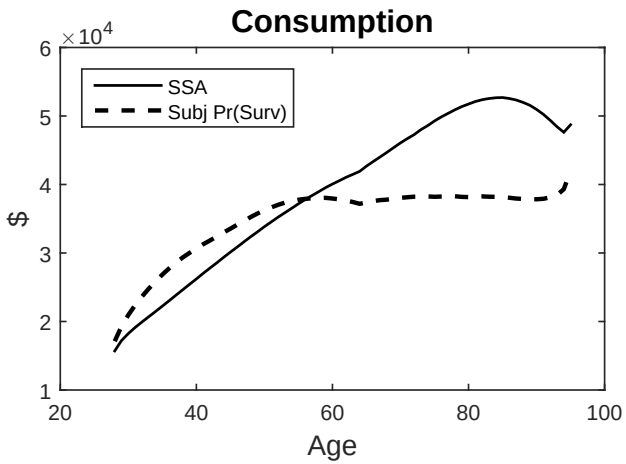
$$V_t^*(X_t, P_t) = \max_{C_t, \phi_t} \{u(C_t) + \beta \mathbf{s_t} \mathrm{E_t}\left[V_{t+1}^*(X_{t+1}, P_{t+1})\right] + \ldots$$
$$\ldots + \beta(\mathbf{1} - \mathbf{s_t})\mathrm{E_t}\left[B_{t+1}(R_{t+1}(X_t - C_t))\right]$$

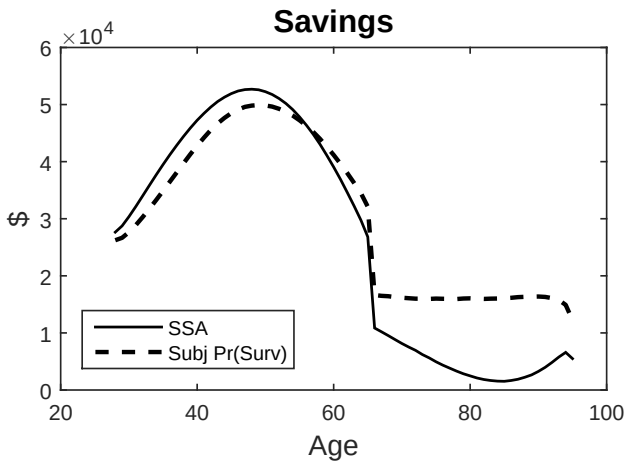
  - where s_t is the period-transition probability, β rate of time preference, B bequest motive.
- Mortality beliefs enter through effective discount factor

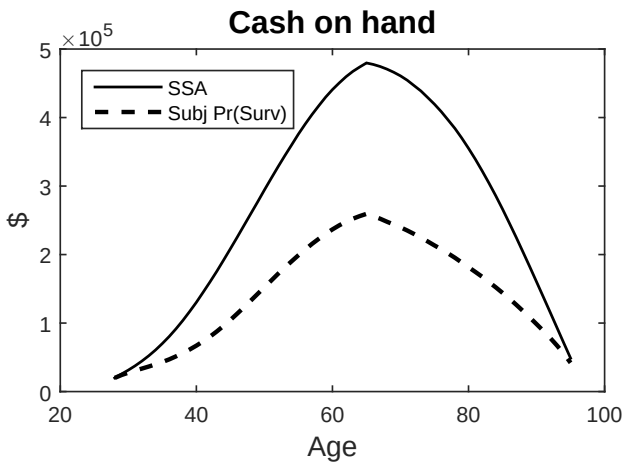
Life-cycle calibration

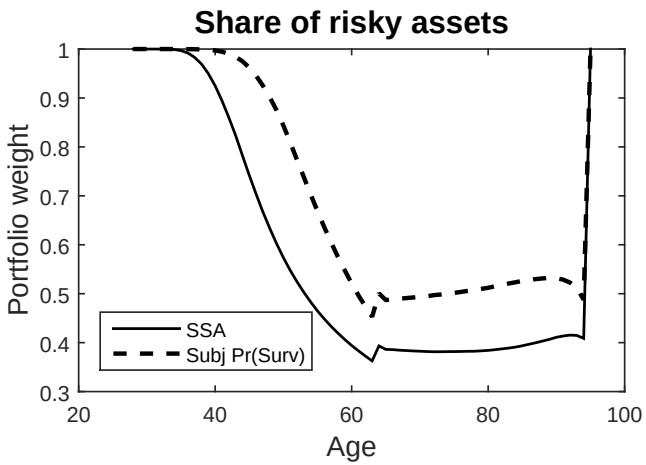
- Horse-race between two specifications:
  - benchmark actuarial tables (SSA) vs. SLEs
  - subjective probabilities s_t:
    - our survey-elicited beliefs vs. ...
    - survival rates from Social Security Administration, 2007
- Other parameters:
  - rate of time preference $\beta = 0.98$
  - $R^f = 2\%$, $R^r = 6\%$, and $\sigma^r = 18\%$
  - risk aversion $\rho = 5$
  - 1970 - 2007 PSID to calibrate income process for married college graduates without dependents
  - $Corr\left(R_t^r, P_t\right) > 0$ during working life, 0 when retired

Life-cycle model results

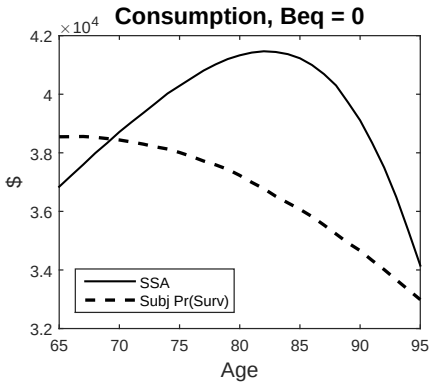


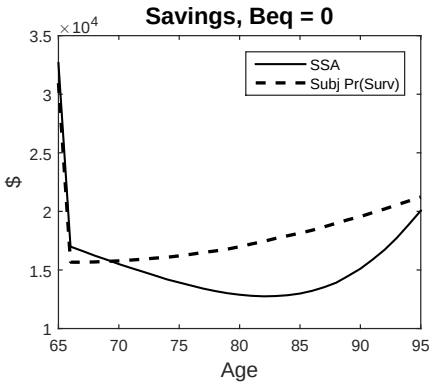


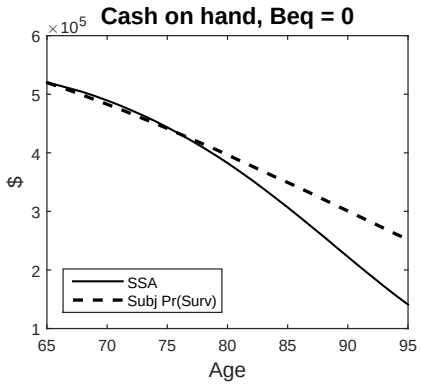


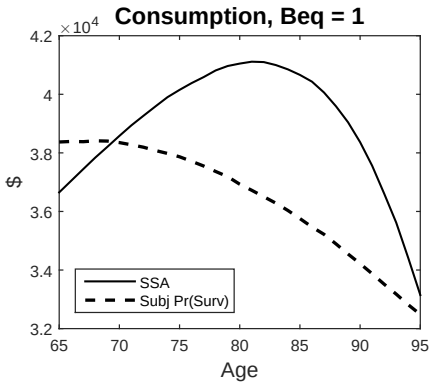


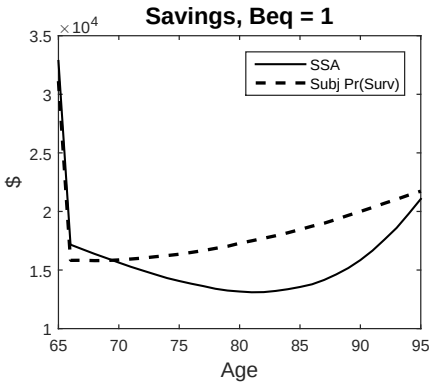
Results: SLEs and retirement

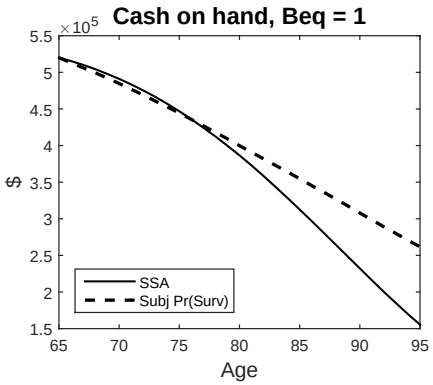






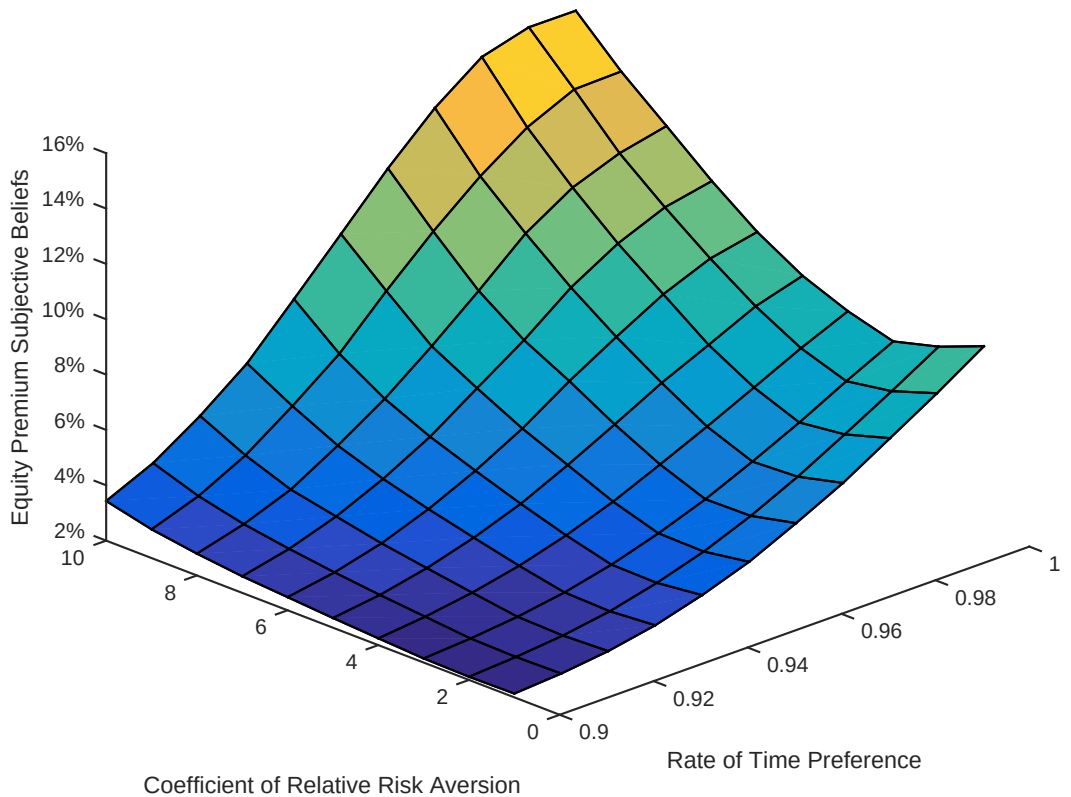






SLEs and asset returns

What equity returns are required to compensate for mortality beliefs? Use GMM to back out equity premium:



Conclusion

- New survey evidence:
  - SLEs have a robustly heavy-tailed distribution
  - SLEs are very heterogeneous
  - expectation errors are correlated w/ financial decision-making
- Using SLEs in a run-of-the-mill life-cycle model can help explain three seemingly disjoint puzzles:
  - the young's under-saving
  - retirees do not fully draw-down assets
  - high required returns on risky asset, given reasonable risk aversion
- Project is ongoing...

Conclusion

Thank you!