Missing the Target?

Retirement Expectations and Target Date Funds

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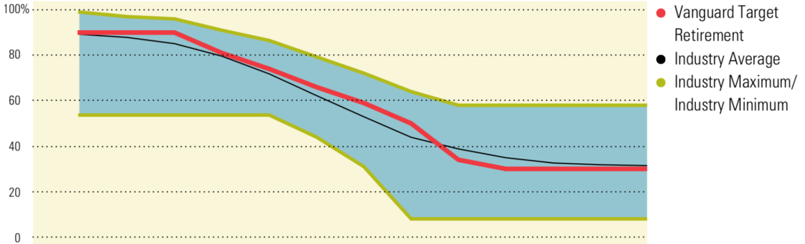
When You Will Retire? Does it Matter?

Do people underestimate how long they will work?
What are the cost of errors?

- Difficult to estimate – related to wealth, earnings, and longevity
  - Uncertainty about how long you will live
  - Risk of running out of money, longevity risk
- Expectations will affect consumption, savings, and labor decisions
  - Errors compounded over decades, may result in significant welfare losses
- Fundamental Assumption Underlying Target Date Funds
  - Target-date funds are one of the most successful innovations
  - Managing roughly $1.6 trillion in target date funds
  - Within 401(k) plans, 27% of assets invested in TDF, cornerstone of 401(k)s

Target Date Funds – Underlying Assumption

Underlying assumption that investors know when they will retirement (far in advance)



Retirement Date	2055	2050	2045	2040	2035	2030	2025	2020	2015	2010	2005	2000	1995
Vanguard Target Retirement	90	90	90	81	74	66	59	50	34	30	30	30	30
Industry Average	89	88	85	80	72	62	53	44	39	35	33	32	31

What do we find?

Our analysis can be divided into four parts:

[A] Document Error in Expectations

[B] Develop Life-cycle Model

[C] Calibrate and Simulate the Model

[D] Study Heterogeneity of Errors

>> Investors tend to underestimate their time until retirement by 1.8 years

>> Errors compounded over decades, cost the median respondent over 10.6% of retirement wealth, or $22,216

Documenting Biases in Expectations

Sample Construction:

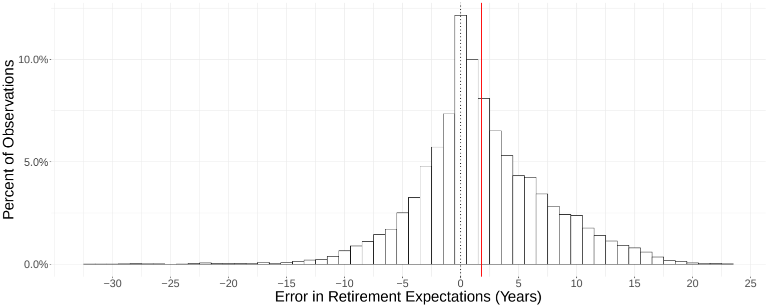
- HRS – biennial waves between 1992 and 2018, exploit long follow-up period
- Conservative approach when measuring errors – limit retirement expectations to be drawn from 1992-2002 survey waves.
- Employment section asked about their retirement plans – observe respondent's future expected retirement date and ultimate retirement event

Measuring Errors:

$$Error_{it} = Actual_{it} - Expected_{it} \tag{1}$$

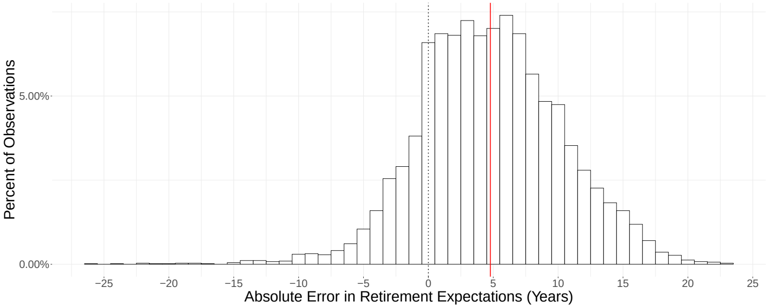
$$RelativeError_{it} = \frac{Actual_{it} - Expected_{it}}{Expected_{it}} \tag{2}$$

[A] Errors in Expectations – Full Sample



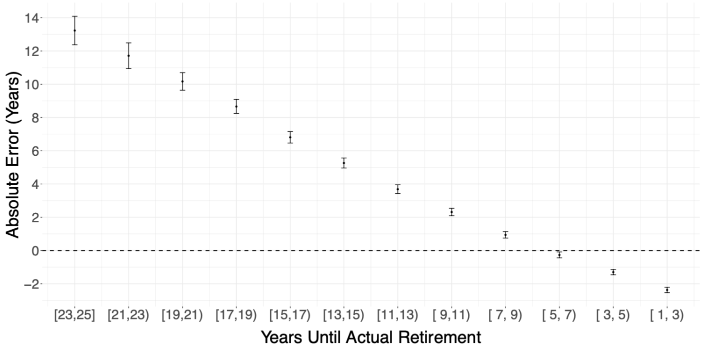
How About Long Run Estimates?

[A] Errors in Expectations – Long Run Estimates



Are Households Updating There Expectations?

[A] Errors in Expectations – Converge



What does this have to do with target date funds?

[B] Model Overview

Develop a model that can measure the cost of errors in expectations:

1. **Health Transitions**
   - Agent's health status i_t is a stochastic process indexed by 1 to 4
   - 1 to 4 correspond to: good health, fair health, poor health, mortality, respectively.
   - Transitions to worse health states are irreversible.

2. **Labor Income**
   - Uncertainty in earnings:

$$\frac{dY_t}{Y_t} = \mu_i dt + \sigma_i d\mathcal{Z}_t.$$

   - Agent cannot work in poor health

[B] Model Overview

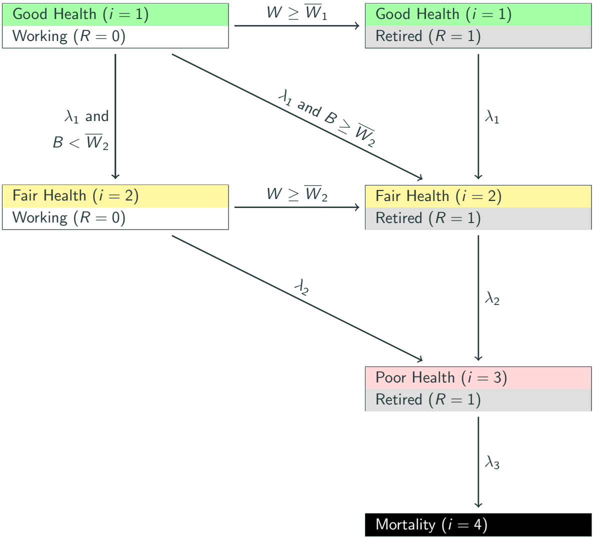
3. **Decision**
    - Agent can trade market portfolio, insurance, consume, and decide when to retire.
    - Retirement is irreversible.
    - $R_t = 1$ when the agent enters retirement, 0 otherwise.
    - Borrowing constraint: $W_t \geq 0$
4. **Subjective Beliefs**
    - Agents have subjective beliefs about their health transitions, $\rightarrow$ linked to how long they will live.

[B] Model Overview

Model Retirement Expectations Through Longevity Expectations:

- **Objective and subjective beliefs of health transition intensities can be different**
    - λ in objective beliefs
    - δ in subjective beliefs
    - The agent is unbiased when $\delta = \lambda$
- Prior research has suggested that agents' life expectancy is underestimated (overestimated) by the young (old) (eg. Heimer, Myrseth, and Schoenle (2019)).
- **Key**: we incorporate expectations about how long you will live.
- Introspectively, when you decide to retire is, in part, decided when you will die.

[B] Model Overview



[B] Model Overview

Agent's Objective and Expectations:

- Expectation under the probability measure induced by agent's subjective beliefs

$$\max_{C,B,\Pi,R} \mathbb{E}_t \left[\int_t^{\tau_D} e^{-\rho(s-t)} U(\ell^{1-R_t} K_{i_t} C_t) dt + e^{-\rho(\tau_D - t)} U(k_4 B_\tau) \right],$$

Preferences:

- CRRA Utility function, with $\gamma > 1$
- $\ell \in (0,1)$ is leisure parameter when working, with the preference for retirement as $1/\ell$

Consumption Multiplier (K_{i_t}):

- Flow utility of consumption is contingent on health status (Finkelstein, Luttmer, and Notowidigdo, 2009, 2012).
- If $K_i > K_{i+1}$, consumption and health are substitutes
- If $K_i < K_{i+1}$ consumption and health are complements
    - Marginal utility of driving a luxury car may decrease with physical disability

[B] Model Overview – Wealth to Earnings Ratio, $(w = W/Y)$

Retirement decisions is tightly related wealth and earning:

- An agent can retire if they have sufficiently high enough wealth
- Option cost of retiring with higher earnings is large

Due to homogeneity, we can reduce agent's problem to one dimension:

- Scaled wealth by earnings — $w = W/Y$
- Re-write the agent's value function

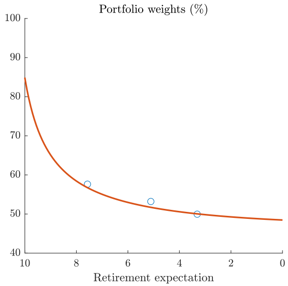
We can use this to determine the endogenous retirement decision:

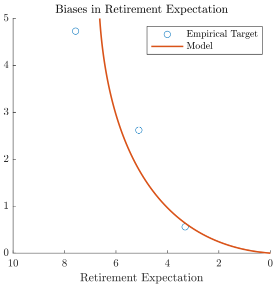
- Retirement decisions will be different for objective vs. subjective beliefs
- Can compute the time until retirement, closed form solution for calibration

[C] Calibration/Simulation/Welfare

Study the implications of our model, realistic calibration

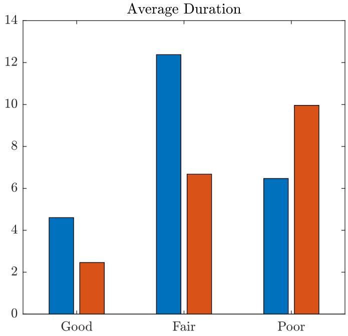
- **Divide all individuals based on health and time until retirement**
- **Target equity exposures and biases in retirement expectations**
- **Jointly calibrate**
  - preferences
  - labor income dynamics
  - health capital dynamics

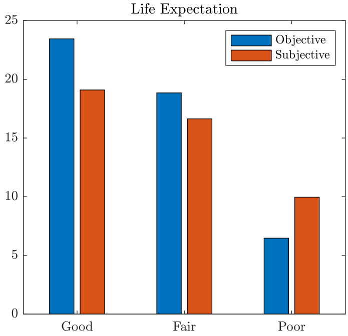




Beliefs About Time in Health States

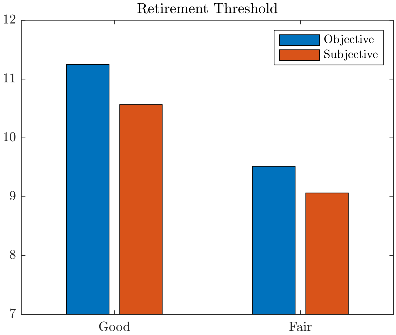
- Subjective beliefs increasing as agents transition to poor health
- This matches prior evidence in the literature





Endogenous Retirement Thresholds

- Retirement threshold is decreasing in health status
- Subjective beliefs have a lower threshold
- Health shock from good to fair: Agent with subjective beliefs and pre-shock wealth-earning ratio greater than 8 retires

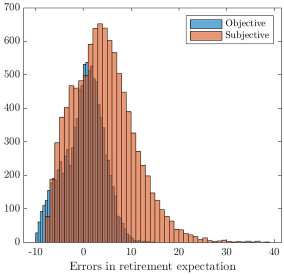


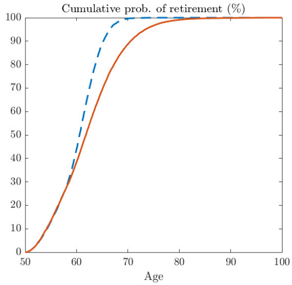
Simulation for the median investor:

- Agents act on their objective (subjective) beliefs about their health process
- The life cycle begins at age 50, the wealth-earning ratio is 4, and, in good health, $i = 1$
- Assuming that the initial real earning is $40,000 per year, the average wealth at retirement is $209,799 and $187,583 for objective and subjective beliefs, respectively
- The difference is $22,216, which is 10.59% of the retirement wealth of objective beliefs.

[C] Calibration/Simulation/Welfare – Retirement Expectations

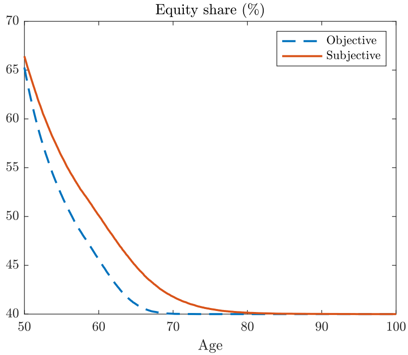
- Biases in health expectations lead to biases in retirement expectations and increase the probability of working longer
- The average retirement age is 60 and 62 under objective and subjective beliefs, respectively





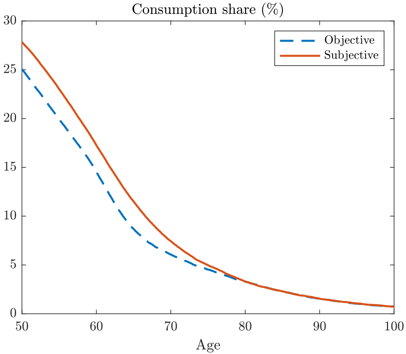
[C] Calibration/Simulation/Welfare – Risky Asset

- Model is able to mimic target date fund glide path. Subjective beliefs lead to higher risky share
- Subjective beliefs induce lower effective risk aversion



[C] Calibration/Simulation/Welfare – Consumption

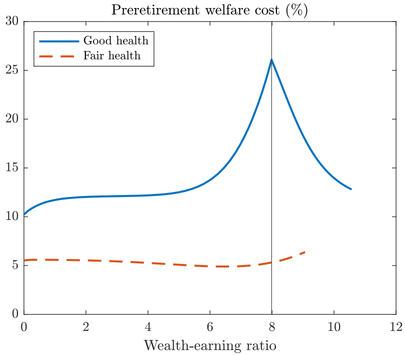
- Consumption is higher with subjective beliefs
- Marginal value of wealth is lower with pessimism



What is the welfare costs for agents?

[C] Calibration/Simulation/Welfare

- Consider the ratio between optimal and suboptimal CE wealth
- For the median investor, this costs roughly 12% of CE wealth in Good health
- Early retirement triggered by a health shock from good to fair causes significant welfare loss.



Errors in Retirement Expectations Matter

People underestimate how long they will work, which can have large and important costs.

- ★ Analysis suggests households underestimate their time until retirement
- ★ Develop a novel lifecycle model that incorporates key elements of health, earnings, retirement, and uncertainty
- ★ Calibration model suggest these are costly – 10.59% of retirement wealth for the median agent
- ★ Errors tend to be larger for minorities
- ★ Potential policy implications – important not to apply a one size fit all with TDF

[B] Model Overview – Retired $(R = 1)$

Upon retirement in health status $i = \{1, 2, 3\}$, the value function is given by:

$$V_i(W) = \frac{(k_i W)^{1-\gamma}}{1-\gamma},$$

The optimal decision rules are given by

$$\begin{aligned} C_t &= k_i^{1-\psi} K_i^{\psi-1} W_t && (3) \\ B_t &= \theta_i^{-\psi} k_i^{1-\psi} k_{i+1}^{\psi-1} W_t && (4) \\ \Pi_t &= \frac{\eta}{\gamma \sigma_S} W_t, && (5) \end{aligned}$$

where $\psi = 1/\gamma$ and $\theta_i = \lambda_i / \delta_i$.

[B] Model Overview – Working $(R = 0)$

Value function $J_i(W, Y)$ solves the following HJB equation:

$$
\begin{aligned}
(\rho + \delta_i) J_i = & \max_{C,B,\Pi} U(\ell K_i C) + \delta_i \max\{V_{i+1}(B), J_{i+1}(B, Y)\} \\
& + (rW + \Pi(\mu_S - r) + \lambda_i(W - B) + Y - C)\frac{\partial J_i}{\partial W} + \mu_i Y \frac{\partial J_i}{\partial Y} \\
& + \frac{1}{2}\Pi^2 \sigma_S^2 \frac{\partial^2 J_i}{\partial W^2} + \Pi Y \sigma_S \sigma_i \frac{\partial^2 J_i}{\partial W \partial Y} + \frac{1}{2} Y^2 \sigma_i^2 \frac{\partial^2 J_i}{\partial Y^2}.
\end{aligned}
$$

Upon transition in health:

- The agent has a choice between immediate retirement or continuing work.
- Intensity δ_i, agent takes the maximum of either the post-retirement value function or continuation

[B] Model — Consumption, Bequest, and Portfolio Ratios

We obtain the optimality as a ratio of earnings:

$$
\begin{aligned}
c(w) &\equiv \frac{C(W,Y)}{Y} = (\ell K_i)^{\psi-1}(p_i'(w))^{-\psi} \\
b(w) &\equiv \frac{B(W,Y)}{Y} = \begin{cases} (p_{i+1}')^{-1}(\theta_i p_i'(w)) & \text{if } w \in [0, \underline{w}_i) \\ k_i^{\psi-1}(\theta_i p_i'(w))^{-\psi} & \text{if } w \in [\underline{w}_i, \overline{w}_i), \end{cases} \\
\pi(w) &\equiv \frac{\Pi(W,Y)}{Y} = -\frac{(\mu_S - r)p_i'(w)}{\sigma_S^2 p_i''(w)} + \frac{\sigma_i(\gamma p_i'(w) + w p_i''(w))}{\sigma_S p_i''(w)},
\end{aligned}
$$

We can now determine the endogenous retirement:

- Retirement decisions will be different for objective vs. subjective beliefs
- Can compute the time until retirement, closed form solution for calibration