Jointly Estimating Risk Aversion and Intertemporal Elasticity of Substitution for Recursive Preferences Using Micro-data

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Research Question

Is precautionary saving channel a mechanism for transmission and amplification of aggregate uncertainty shocks through the household sector?

Background

- Household drive macroeconomic activity through
  - Utility specification i.e recursive preference vs CRRA
  - Calibration of household preference over risk i.e., coefficient of relative risk aversion
  - Calibration of household preference over time i.e., intertemporal elasticity of substitution

Theory

Precautionary Saving Hypothesis

$\uparrow$ in *Uncertainty* $\implies \downarrow$ consumption now, $\uparrow$ savings

$\implies \uparrow$ consumption tomorrow $\implies \uparrow \mathbb{E}$(*consumption growth*)

In a regression of E(consumption growth) on Uncertainty, we expect positive coefficient

For a given level of uncertainty, expected consumption growth should be increasing in RRA

E(consumption growth) is a function of risk aversion

Hence, exists a mapping between RRA and the regression coefficient on Uncertainty

Methodology

Use HH level microdata from Survey of Consumer Expectations for US HH's

- Empirically investigate the precautionary saving and intertemporal substitution channels
- Combine evidence from microdata with a simulation-based estimator - indirect inference to structurally estimate deep parameters for EZ preference
- Discipline calibration of DSGE models with microdata consistent estimates
- Study the consequences in a macroeconomic context

Findings

Is precautionary saving channel a mechanism for transmission and amplification of aggregate uncertainty shocks through the household sector?

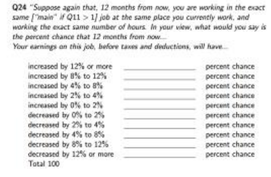
1. No, need to look for other theoretical channels.
2. Household behavior in microdata consistent with standard precautionary saving and intertemporal substitution channel.

   $\uparrow$ uncertainty $\implies \uparrow$ planned spending growth
   $\uparrow$ expected inflation $\implies \downarrow$ planned spending growth
3. Jointly estimated value of RRA and IES is 0.25 and 0.62 respectively for Epstein-Zin preferences.
4. Households are close to risk-neutral.

Survey of Consumer Expectations by NY FED

- Nationally representative, rotating panel of approx. 1300 household heads at monthly frequency
- Respondents participate in the panel for up to 12 months
- Complete Micro dataset available with a lag of 10 months
- Sample: 2013:06 to 2019:04
- Core monthly modules on expectations about macro-economic and hh level variables like inflation, earnings growth, HH spending growth, credit access, job loss, job switch, health status, spouse working status etc

SCE: Wage uncertainty



Q24 "Suppose again that, 12 months from now, you are working in the exact same [*main* if Q11 > 1] job at the same place you currently work, and working the exact same number of hours. In your view, what would you say is the percent chance that 12 months from now...
Your earnings on this job, before taxes and deductions, will have...

increased by 12% or more	percent chance
increased by 8% to 12%	percent chance
increased by 4% to 8%	percent chance
increased by 2% to 4%	percent chance
increased by 0% to 2%	percent chance
decreased by 0% to 2%	percent chance
decreased by 2% to 4%	percent chance
decreased by 4% to 8%	percent chance
decreased by 8% to 12%	percent chance
decreased by 12% or more	percent chance
Total 100	

SCE: Wage uncertainty

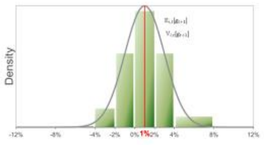


Figure: Constructing idiosyncratic measures of household beliefs about wage growth

Empirical Setup

$$\mathbb{E}_{i,t}[C_{i,t+1}] = \alpha + \beta_1\ \mathbb{E}_{i,t}[U_{i,t+1}] + \beta_2\ \mathbb{E}_{i,t}[\pi_{i,t+1}] + I_{i,t}\ \beta_3 + D_{i,t}\ \beta_4 + T_t \times R\ \beta_5 + \epsilon_{i,t}$$

Where,
$\mathbb{E}_{i,t}[C_{i,t+1}]$ is the idio. exp household consumption growth over 12-months.
$\mathbb{E}_{i,t}[U_{i,t+1}]$ is the idio. measure of wage uncertainty.
$\mathbb{E}_{i,t}[\pi_{i,t+1}]$ is the idio. measure of expected inflation.
$I_{i,t}$ is a vector of idio. expectations controls- wage growth, job loss and default.
$D_{i,t}$ is a vector of demographic controls- income dummies and census region
α_i is individual fixed effects intercept.
T_t is a vector for time effect, a dummy for each time period
R is a vector of dummy for each region

Selected Baseline Results

Sample: 2013:06 to 2019:06	
Dependent variable: Expected household spending over next 12 months	
Independent variables	Coefficients
Wage growth uncertainty ($\hat{\beta}_1$)	0.147***
	(0.0284)
Inflation expectations ($\hat{\beta}_2$)	−0.860***
	(0.0297)
Region × Time fixed effect	Yes
Observations	46003
Adjusted R^2	0.222

Standard errors in parentheses.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

1. One percentage point increase in wage growth uncertainty imply that households expect 0.14 percentage point increase in planned spending growth.
2. One percentage point increase in expected inflation imply that households expect 0.86 percentage point decrease in planned spending growth.

Structural Estimation of Household Utility

- Combine reduced-form estimate with simulation-based method Indirect Inference

$$\hat{\psi}_{S,T}(W) = argmin_{\psi}\ \left[\hat{\theta}^d_T - \hat{\theta}^s_T(\psi)\right]' \times W_T^{-1} \times \left[\hat{\theta}^d_T - \hat{\theta}^s_T(\psi)\right]$$

$\hat{\theta}^d_T$ is the estimated regression coefficients from data
$\hat{\theta}^s_T$ is the simulated coefficients from the S simulations of T observations
W_T is the weighting matrix

Identification: monotonic mapping between estimated structural parameter and target moment

Income fluctuation problem of household

$$\max_{C_{i,t}\geq 0, B_{i,t+1}} \quad V_{i,t} = \left\{(1-\beta)\ C_{i,t}^{1-\frac{1}{\sigma}} + \beta\ \mathbb{E}_t\left(V_{i,t+1}^{1-\gamma}\right)^{\frac{1-\frac{1}{\sigma}}{1-\gamma}}\right\}^{\frac{1}{1-\frac{1}{\sigma}}}$$

s.t.
$$P_t\ C_{i,t} + B_{i,t+1} \leq P_t\ Y_{i,t} + R\ B_{i,t}$$
$$P_{t+1}\ Y_{i,t+1} = (1 + g_{i,t+1}) P_t\ Y_{i,t}$$
$$g_{i,t} = \rho_g\ g_{i,t-1} + e^{\kappa_{i,t-1}}\ u_{i,t} \qquad u \sim N(0,1)$$
$$\kappa_{i,t} = \rho_\kappa\ \kappa_{i,t-1} + \kappa\ e_{i,t} \qquad e \sim N(0,1)$$
$$\pi_{i,t} = \rho_\pi\ \pi_{i,t-1} + \pi\ \epsilon_{i,t} \qquad \epsilon \sim N(0,1)$$

Where γ is the coefficient of relative risk aversion and σ is the IES
κ_t is scaling factor for variance of income growth.

Structural parameters $\hat{\psi} = [\gamma, \sigma]$

Targets from microdat $\hat{\theta}^d_T = [\hat{\beta}_1, \hat{\beta}_2]$

Meaning	Parameter	Estimate
Coefficient of Relative Risk Aversion	γ	0.25 (0.01)
Elasticity of intertemporal substitution	σ	0.62 (0.01)
Minimized distance		10^{-11}

Standard error in parentheses.
M=100 path of simulated data, T=10,000 HH, discard 500 obs as burn-in.

- Recall, $\hat{\beta}_1$ maps to RRA(γ) and $\hat{\beta}_2$ maps to IES(σ)
- Exactly identified model
- W is the weighting matrix, var-covar matrix of regression coefficients from SCE

Time-varying Aggregate Uncertainty Shocks, Basu and Bundick (2017)

1. NK model with sticky prices.
2. Model includes HH, intermediate goods producer, final goods producer and government
3. HH have Epstein-preferences.
4. They use time-varying volatility of discount rate shocks as an ex-ante measure of uncertainty about future demand
5. They find: "An identified uncertainty shock in the data causes significant declines in output, consumption, investment, and hours worked. "
6. Rely on strong precautionary saving motive among households and time varying endogenous firm markups

Conclusion

Exercise: Change calibrations of household preference with microdata consistent estimate

Parameter	Basu and Bundick (2017)	Microdata estimated
RRA (γ)	80	0.25
IES (σ)	0.95	0.62

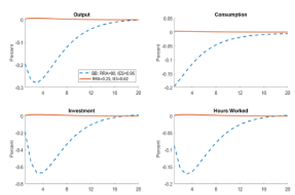


Figure: Response of macroeconomic aggregates to uncertainty shock from Basu and Bundick (2017)

No, precautionary saving channel is not a mechanism for transmission and amplification of aggregate uncertainty shocks through the household sector.

Need to look for other theoretical channel through with households drive macroeconomy.

Other work and contact details

"Disagreement in Consumer Confidence and Business Activity"

"Differences in Labor Market Expectations Across Gender"

"RIP or HIP? Evidence from Household Expectations"

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