Perceived Income Risks

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March 25, 2020

Outline

1. Motivation
2. Stylized facts
   - Cross-sectional patterns
   - Perceived risks and decisions
   - Correlation with the stock market
   - Permanent/transitory decomposition (work in progress)
3. Model (work in progress)
4. Conclusion

Motivation

- Risks matter for individual decisions
  - precautionary saving
  - portfolio choice
- Perceived risks enter in their calculation
- Risks matter for macroeconomic outcomes
  - If idiosyncratic risks are not perfectly insured
  - Different wealth $\rightarrow$ different MPCs $\rightarrow$ distributional channel of macroeconomic policies
- Perceptions $\approx$ " the truth" $\approx$ estimates from inequality ?

This paper's agenda

1. **Empirics:** subjective risk profiles from density surveys
   - differ systematically by age, generation, gender and education
   - non-normality, i.e half of population have non-zero skewness
   - negatively correlate with stock market returns
   - how persistent ? (work in progress)
2. **Theory**: a heterogeneous-agent model with imperfect understanding of income process
   - a model of income expectation
     - for instance, the experience-learning to account for perceptual dfferences
   - build it in a structural heterogenous-agent model

Literature

- "insurance or information": Kaufmann and Pistaferri (2009), Meghir and Pistaferri (2011), Pistaferri (2001), New York Fed Blog (2019), Flavin (1988)
- consumption/saving and portfolio choice incorporating imperfect perception/understanding. Rozsypal and Schlafmann (2017), Carroll et al. (2018), Lian (2019)
- expectation formation, mostly on macroeconomic variables, Coibion and Gorodnichenko (2012), Fuhrer (2018), etc
- subjective survey, especially on probabilist surveys. Manski (2004), Delavande et al. (2011), Manski (2018), Bertrand and Mullainathan (2001), Armantier et al. (2017)
- heterogeneous agent macro (HANK): uninsured idiosyncratic risks lead to ex-post heterogeneity and macro policy transmission. **?**
- long-run risk **?**

Data

Table: Survey of Consumer Expectations

Time period	2013M6-2019M6
Frequency	monthly
Sample size	1,300
Density variable	1-yr-ahead earning growth (same position/hours)
Pannel structure	12 months
Demographics	educ, income, age

- density estimation following (Engelberg et al. (2009))
- exclude top and bottom 3% values for forecast errors and uncertainty

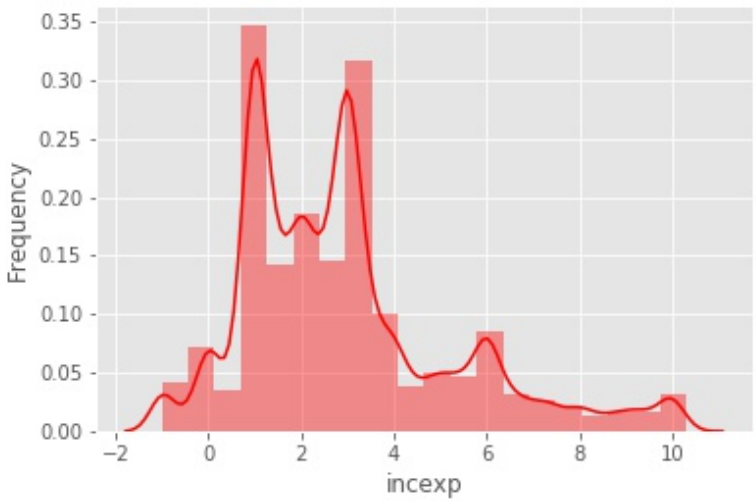
Definition

- Moments to look
  - expected growth, $E_{i,t}(\Delta Y_{i,t+12})$
  - variance: $\overline{var}_{i,t}(\Delta Y_{i,t+12})$
  - skewness: $\overline{skew}_{i,t}(\Delta Y_{i,t+12})$
- Both pereived nominal and real income growth
  - $E_{i,t}(\Delta Y^r_{i,t+12}) = E_i(\Delta Y^n_{i,t+12}) - E_{i,t+12}(\pi_{t+12})$
  - $\overline{var}_{i,t}(\Delta Y^r_{i,t+12}) = \overline{var}_{i,t}(\Delta Y^n_{i,t+12}) + \overline{var}_{i,t}(\pi_{t+12})$
- Conditional on employment
  - Can be converted into the unconditional risk using perceived unemployment risk (same-job-hour risk is just a lower bound).

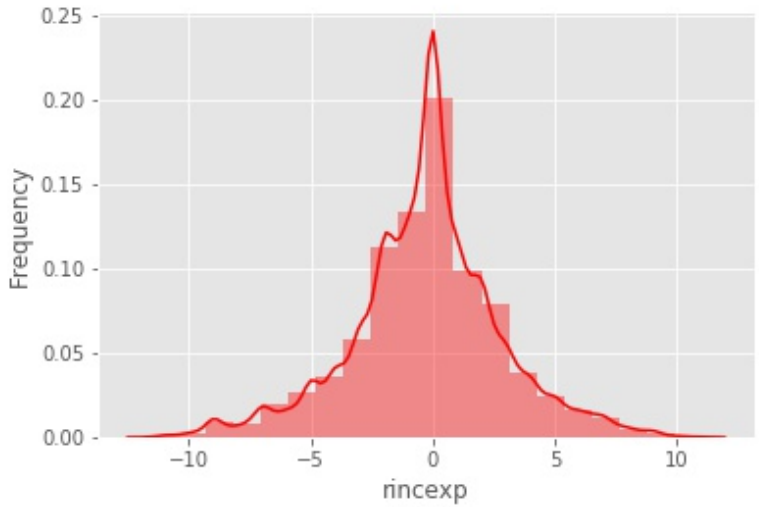
Outline

Cross-sectional distribution of expected income growth

(a) nominal income expectation



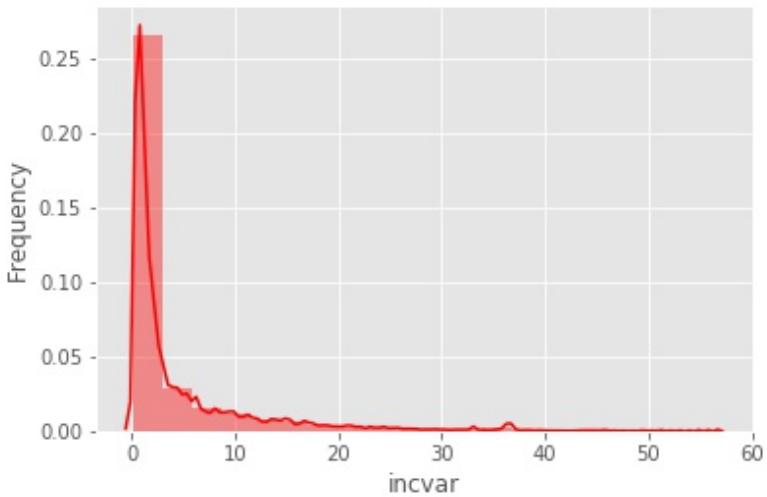
(b) real income expectation



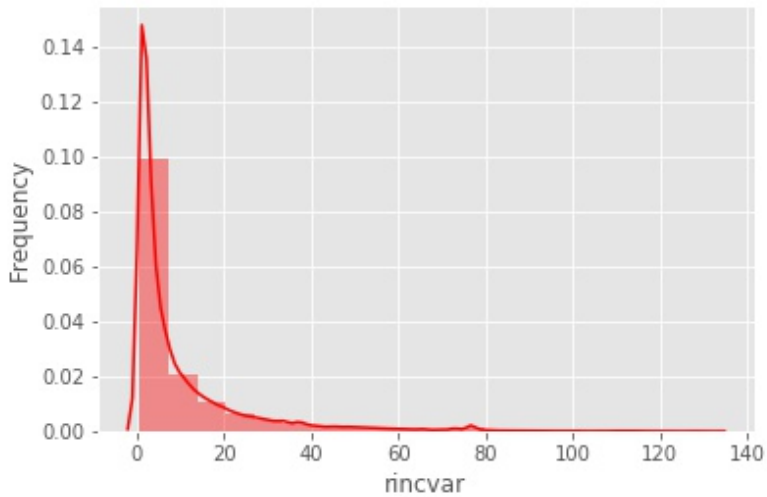
- Nominal rigity can be seen from the expected norminal earning growth, while real expected growth become symmetric

Cross-sectional distribution of income dispersion

(a) nominal income risk



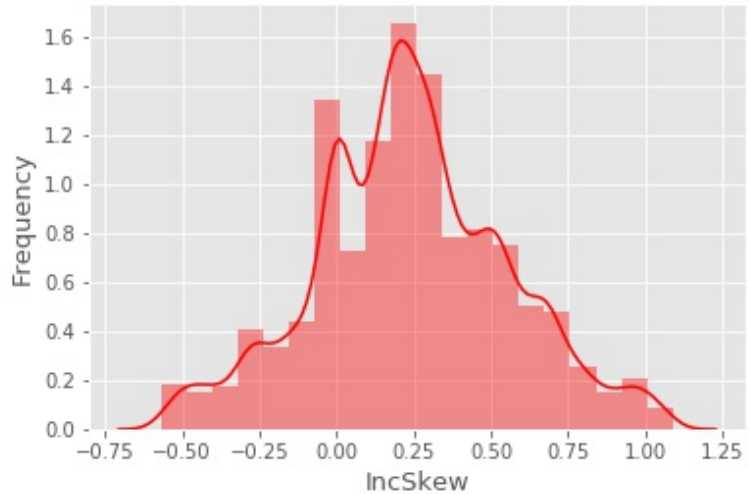
(b) real income risk



- average perceived income risks: 3% standard deviation for nominal and 4% standard deviation for real income
- just a lower bound: before adjustment of unemployment risk

Cross-sectional distribution of tail risks

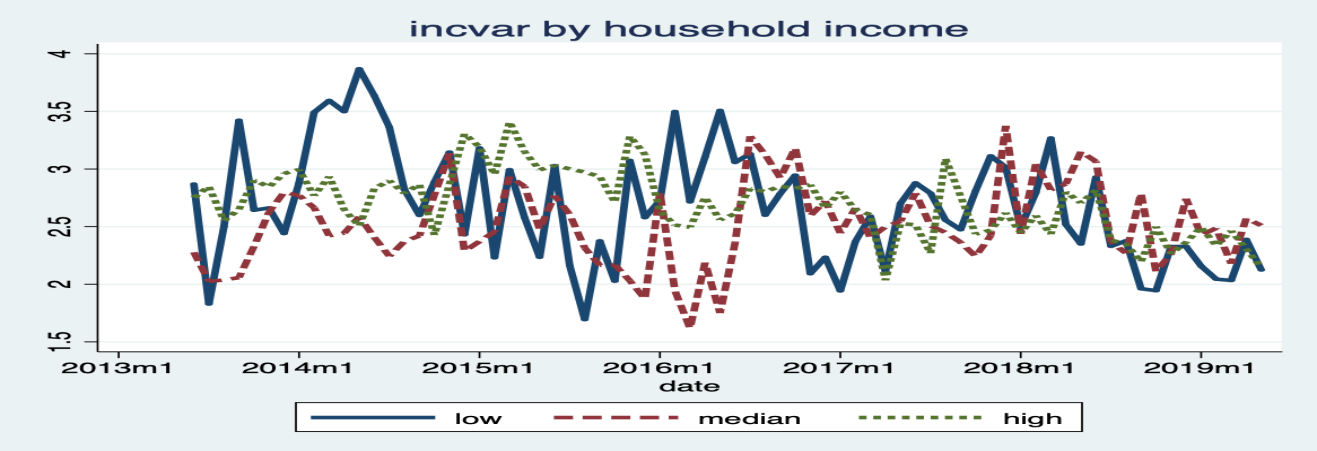
(a) nominal income skewness



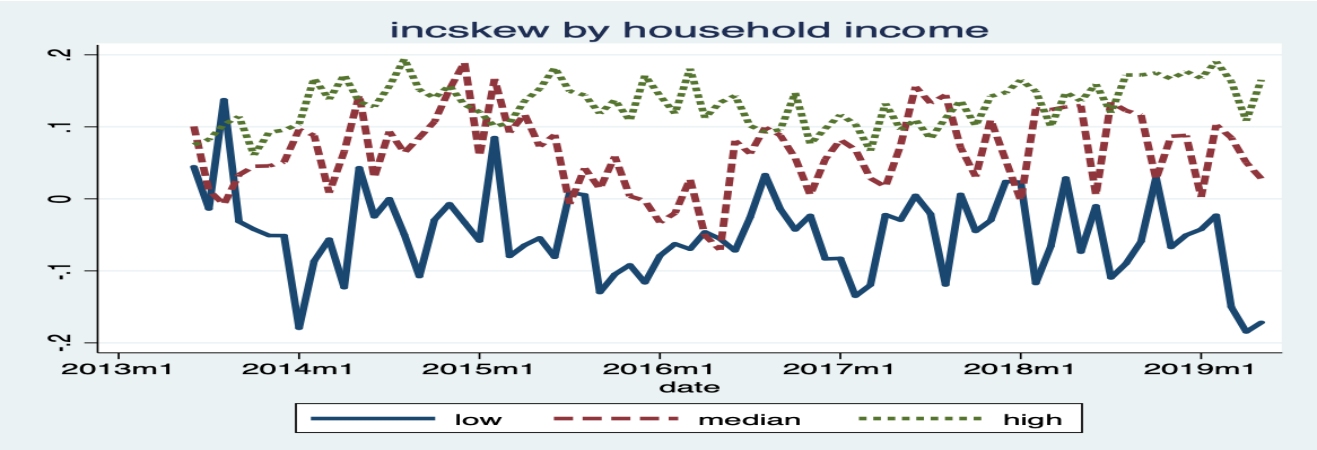
- sizable dispersion in skewness, i.e. about half of the people have non-zero skewness in perceived inome distribution.

Perceived income risks by household income

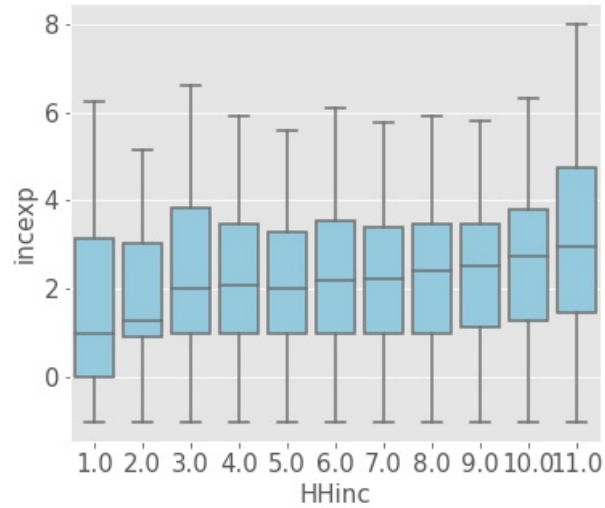
(a) income risks

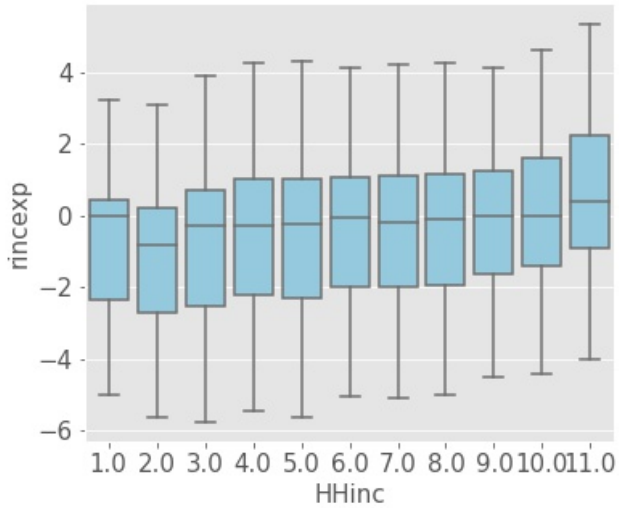


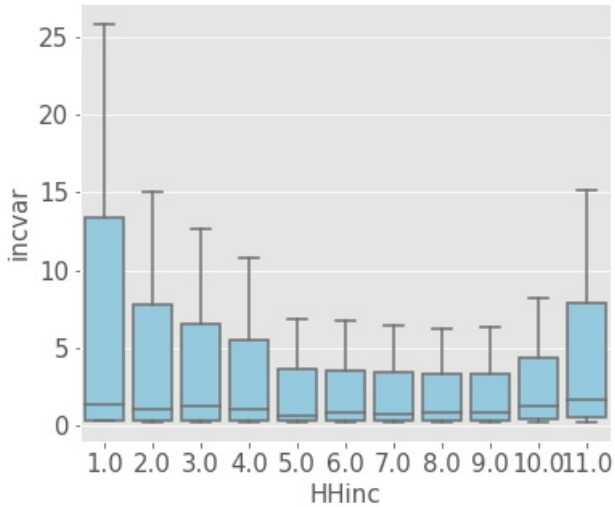
(b) skewness

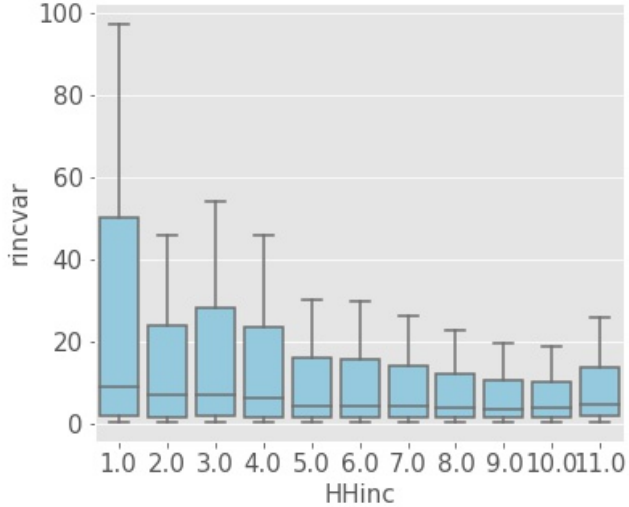


Perceived income risks by household income



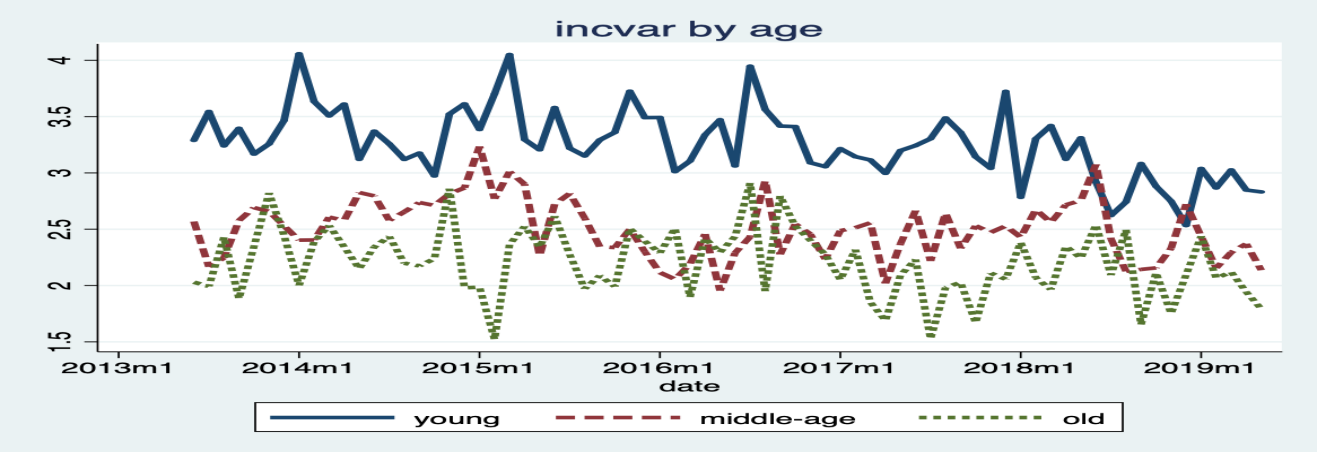




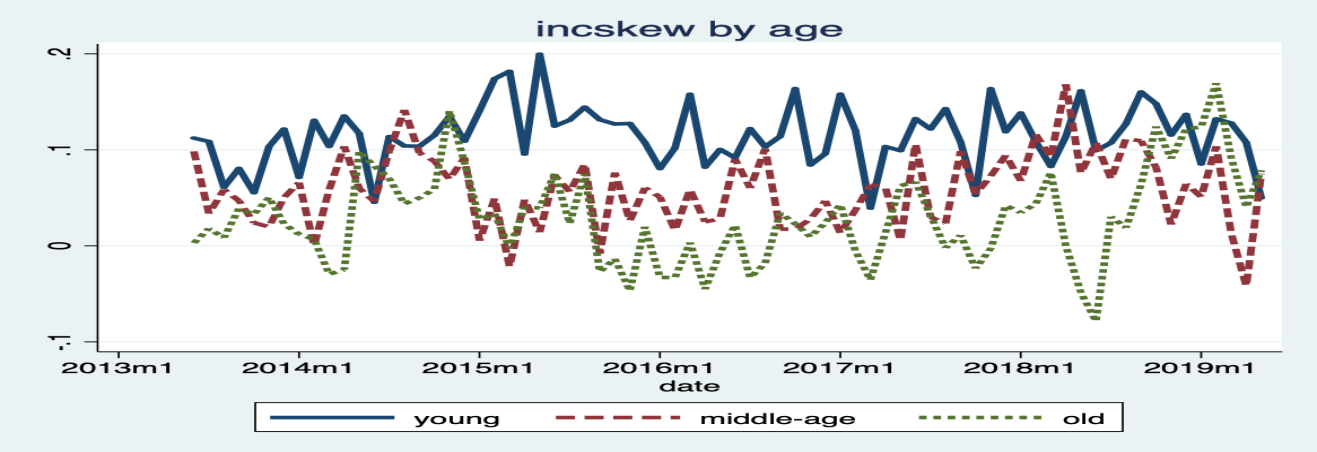


Perceived income risks by age

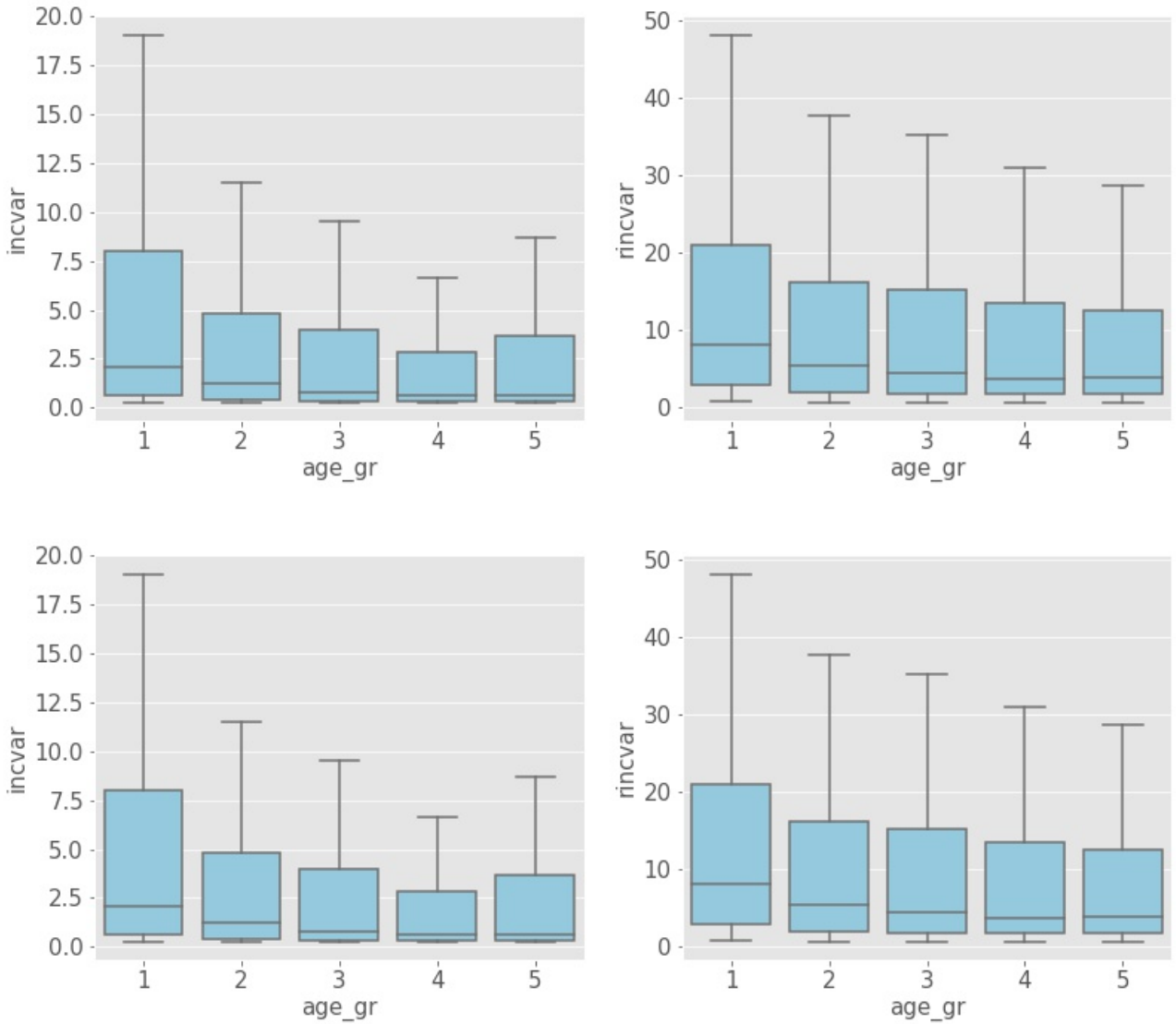
(a) risks



(b) skewness

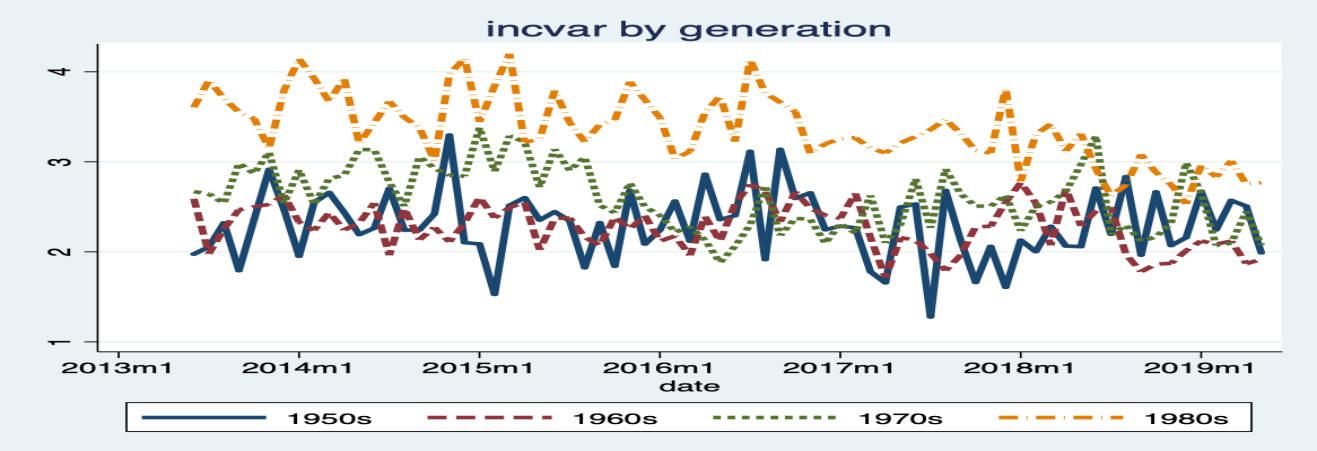


Perceived income risks by age

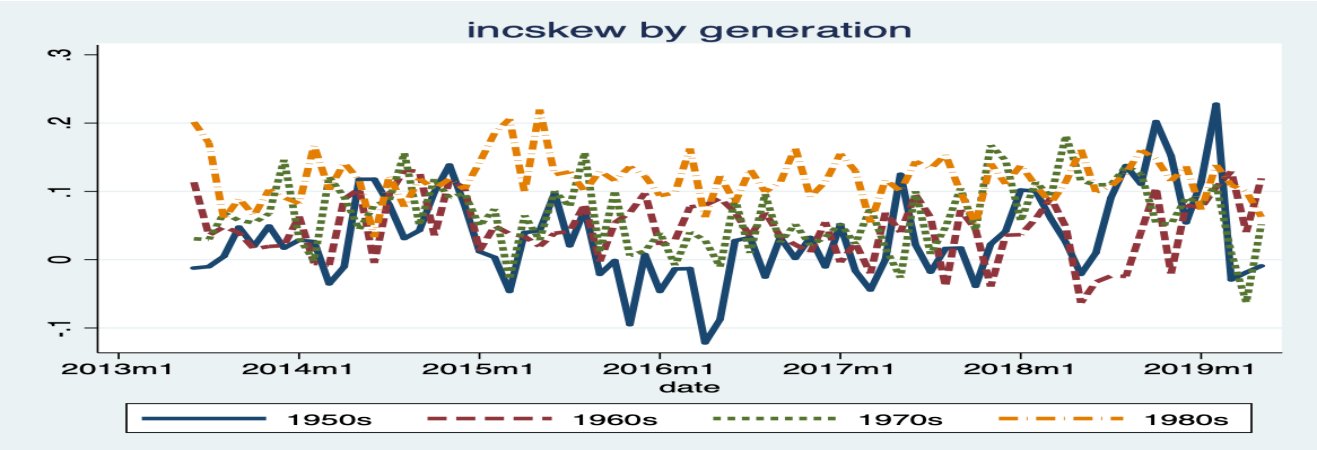


Perceived income risks by generation

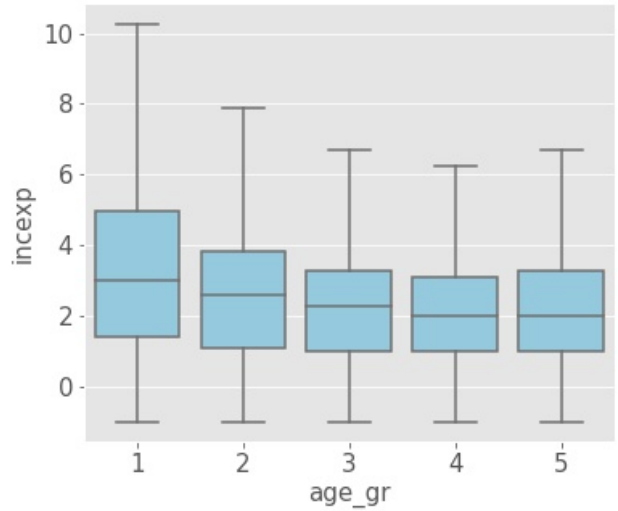
(a) risks

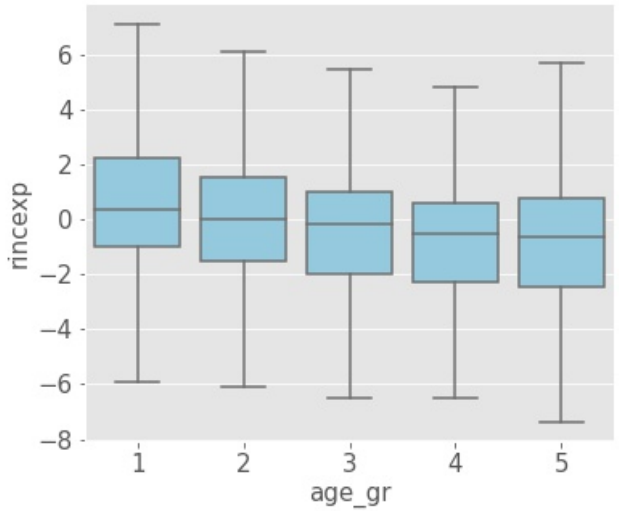


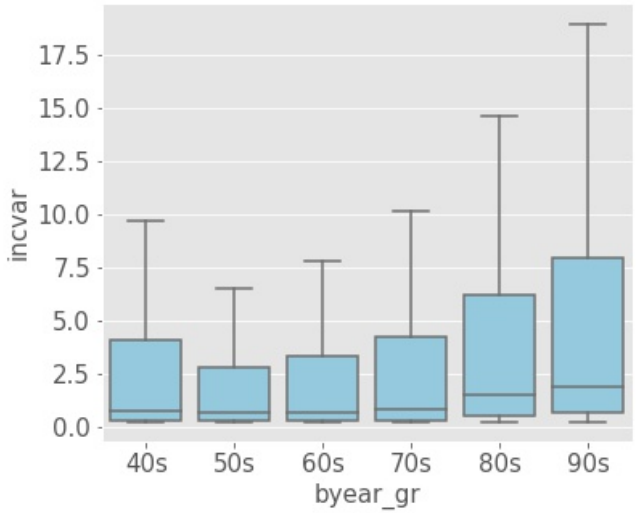
(b) skewness

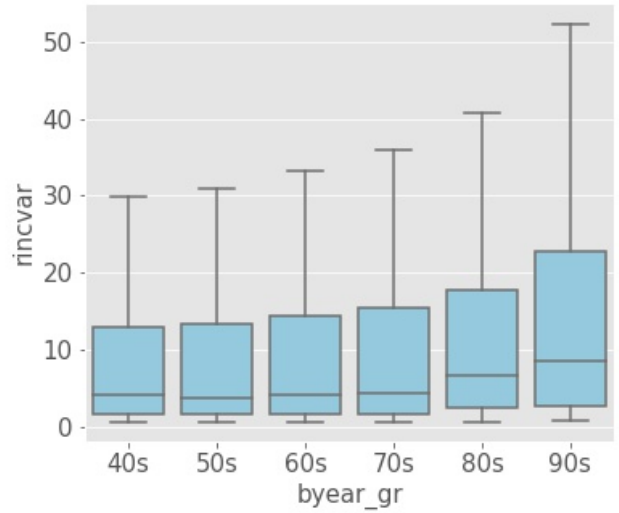


Perceived income risks by generation



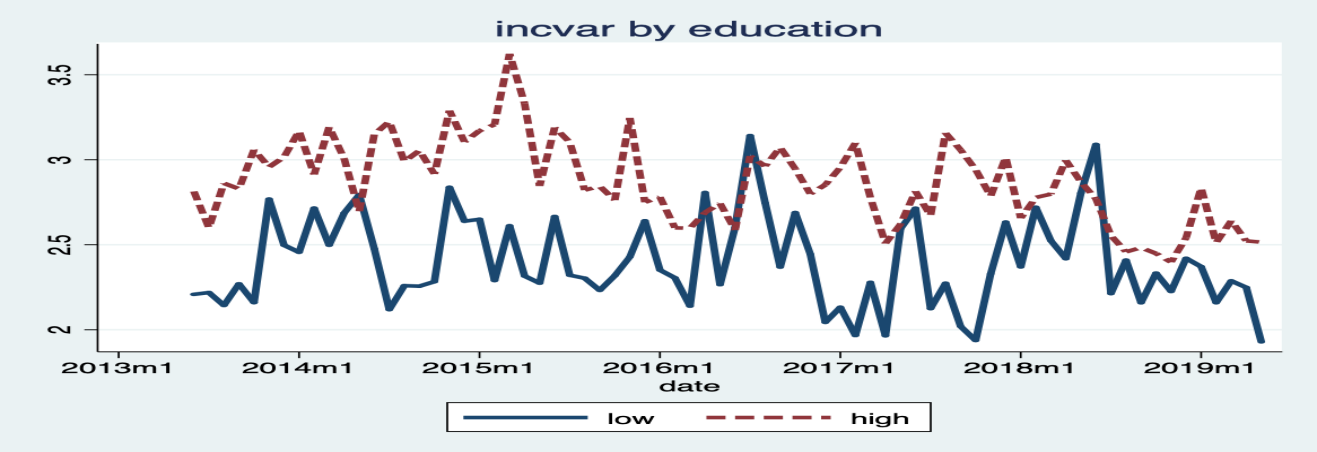




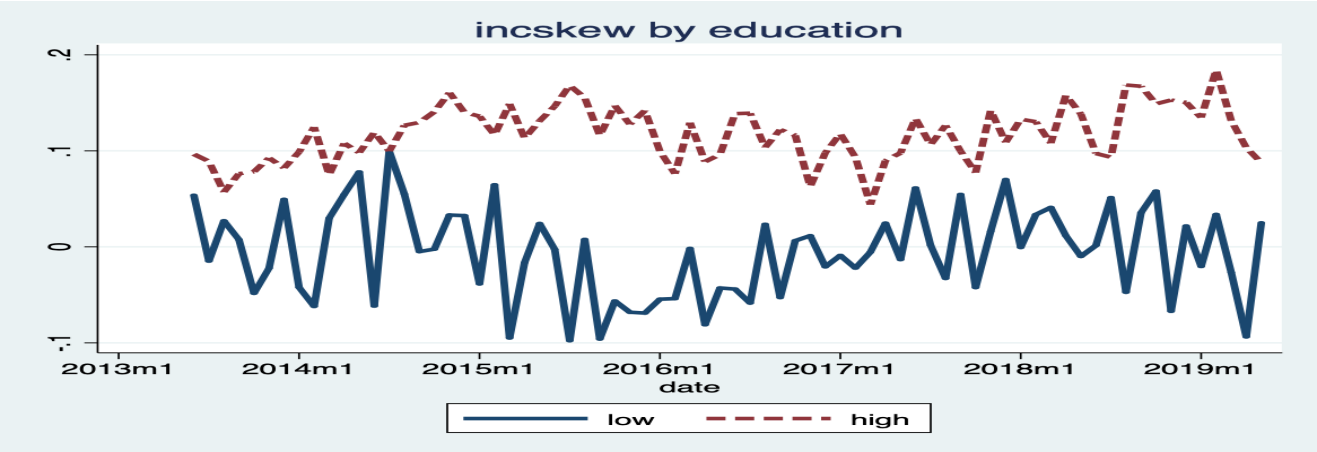


Perceived income risks by education

(a) risks



(b) skewness



Perceived income risks by education

Covariants of expected income growth

Table: Expected income growth and individual characteristics

	incexp I	incexp II	incexp III	incexp IIII	rincexp I	rincexp II	rincexp III	rincexp IIII
HHinc_gr=low inc			-0.03				-0.39***	
			(0.02)				(0.03)	
educ_gr=low educ				-0.25***				-0.63***
				(0.02)				(0.03)
gender=male				-0.32***				-0.78***
				(0.02)				(0.03)
parttime=yes	-0.47***	-0.36***	-0.35***		-0.63***	-0.53***	-0.44***	
	(0.03)	(0.03)	(0.03)		(0.04)	(0.04)	(0.04)	
selfemp=yes	0.86***	-0.00***	0.00***		0.84***	-0.00***	-0.00***	
	(0.03)	(0.00)	(0.00)		(0.05)	(0.00)	(0.00)	
Stkprob		0.01***	0.01***			0.02***	0.02***	
		(0.00)	(0.00)			(0.00)	(0.00)	
UEprobInd		-0.01***	-0.01***			-0.02***	-0.02***	
		(0.00)	(0.00)			(0.00)	(0.00)	
Intercept	2.82***	2.57***	2.58***	3.05***	-0.29***	-0.92***	-0.80***	0.20***
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
N	54275	48606	48606	47712	49702	44446	44446	43694
R2	0.01	0.02	0.02	0.01	0.01	0.04	0.04	0.02

Covariants of perceived income risks

Table: Perceived income risks and individual characteristics

	incvar I	incvar II	incvar III	incvar IIII	rincvar I	rincvar II	rincvar III	rincvar IIII
HHinc_gr=low inc			1.56***				7.01***	
			(0.10)				(0.19)	
educ_gr=low educ				0.40***				3.82***
				(0.11)				(0.21)
gender=male				-0.80***				2.76***
				(0.10)				(0.19)
parttime=yes	0.05	0.24*	-0.12		1.41***	1.81***	0.19	
	(0.12)	(0.13)	(0.13)		(0.23)	(0.26)	(0.26)	
selfemp=yes	7.21***	-0.00***	-0.00***		6.27***	-0.00***	0.00***	
	(0.15)	(0.00)	(0.00)		(0.27)	(0.00)	(0.00)	
Stkprob		0.01***	0.01***			-0.05***	-0.05***	
		(0.00)	(0.00)			(0.00)	(0.00)	
UEprobAgg		0.01**	0.00*			0.05***	0.04***	
		(0.00)	(0.00)			(0.00)	(0.00)	
UEprobInd		0.03***	0.02***			0.05***	0.04***	
		(0.00)	(0.00)			(0.00)	(0.00)	
Intercept	4.64***	3.75***	3.28***	5.72***	12.42***	12.21***	10.16***	11.16***
	(0.05)	(0.12)	(0.12)	(0.07)	(0.10)	(0.24)	(0.25)	(0.14)
N	54029	47331	47331	47457	50730	44382	44382	44517
R2	0.05	0.00	0.01	0.00	0.01	0.01	0.04	0.01

Outline

Perveived income risks and household spending

Table: Perceived income risks and household spending

	spending I	spending II	spending III	spending IIII	spending IIIII	spending IIIIII	spending IIIIIII
incexp	0.39***						
	(0.08)						
rincexp		-0.04*					
		(0.02)					
incvar			0.07***				
			(0.02)				
rincvar				0.07***			
				(0.01)			
UEprobAgg						0.04***	
						(0.01)	
UEprobInd					-0.01		
					(0.01)		
incskew							0.21
							(0.43)
N	55673	50997	55465	52099	54315	85468	55029
R2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

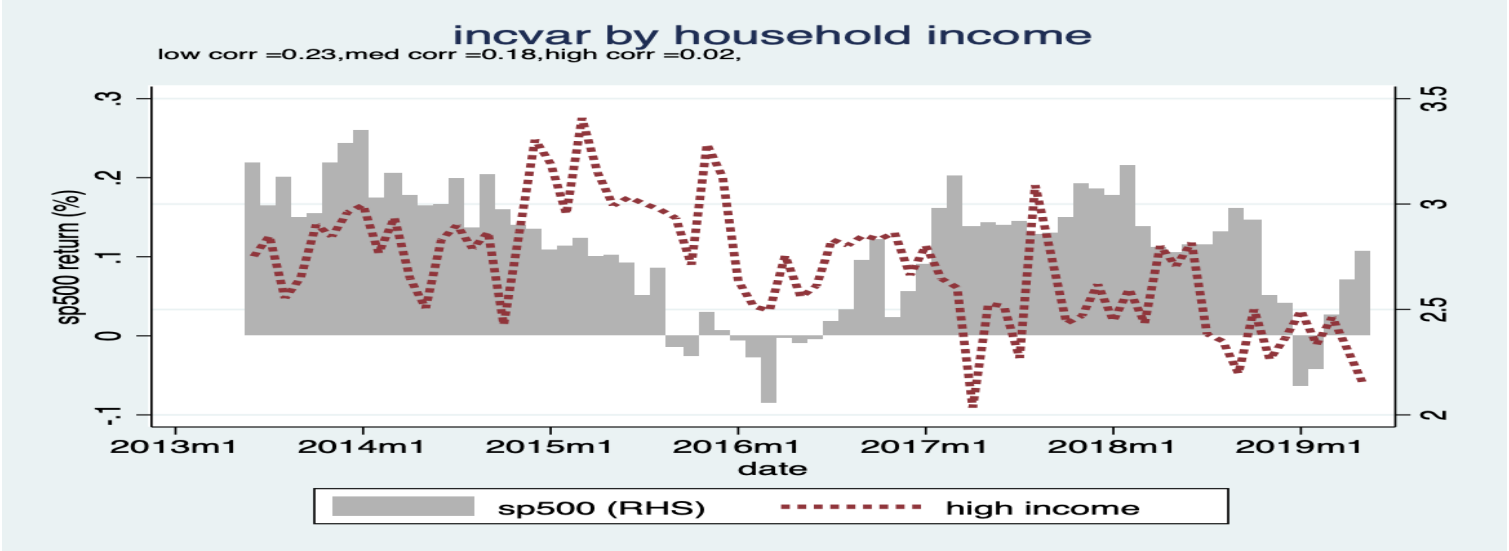
Outline

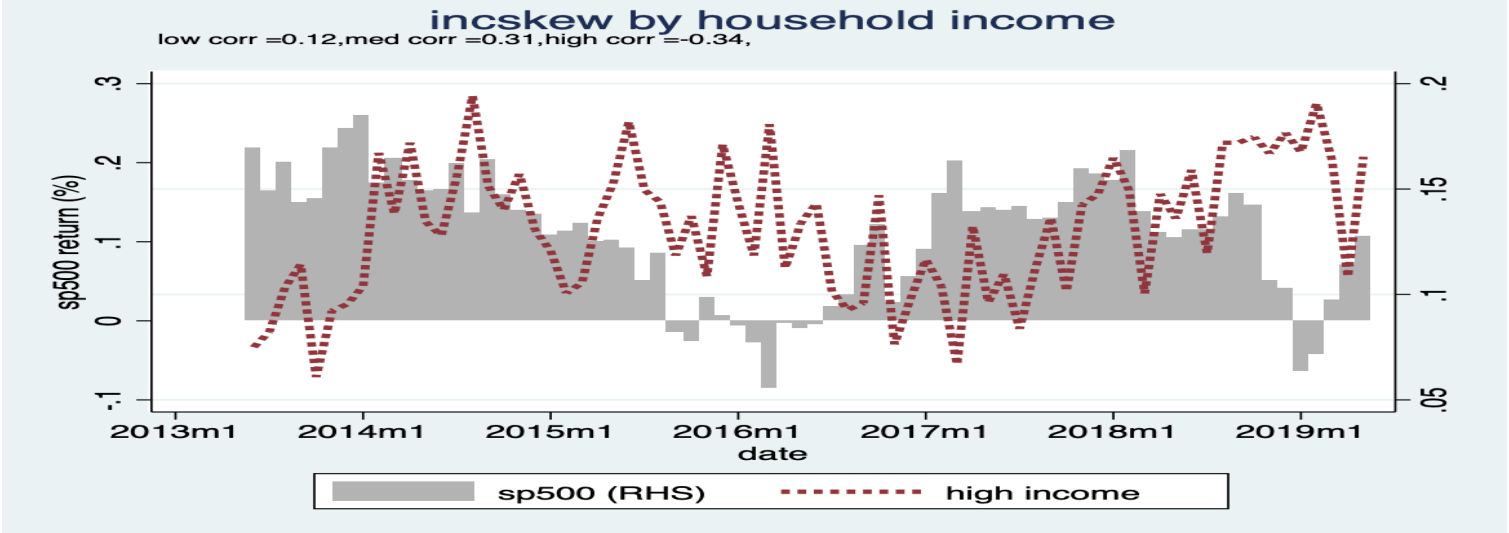
Perceived income risks and stock market performance

Table: Correlation between Perceived Income Risks and Stock Market Return

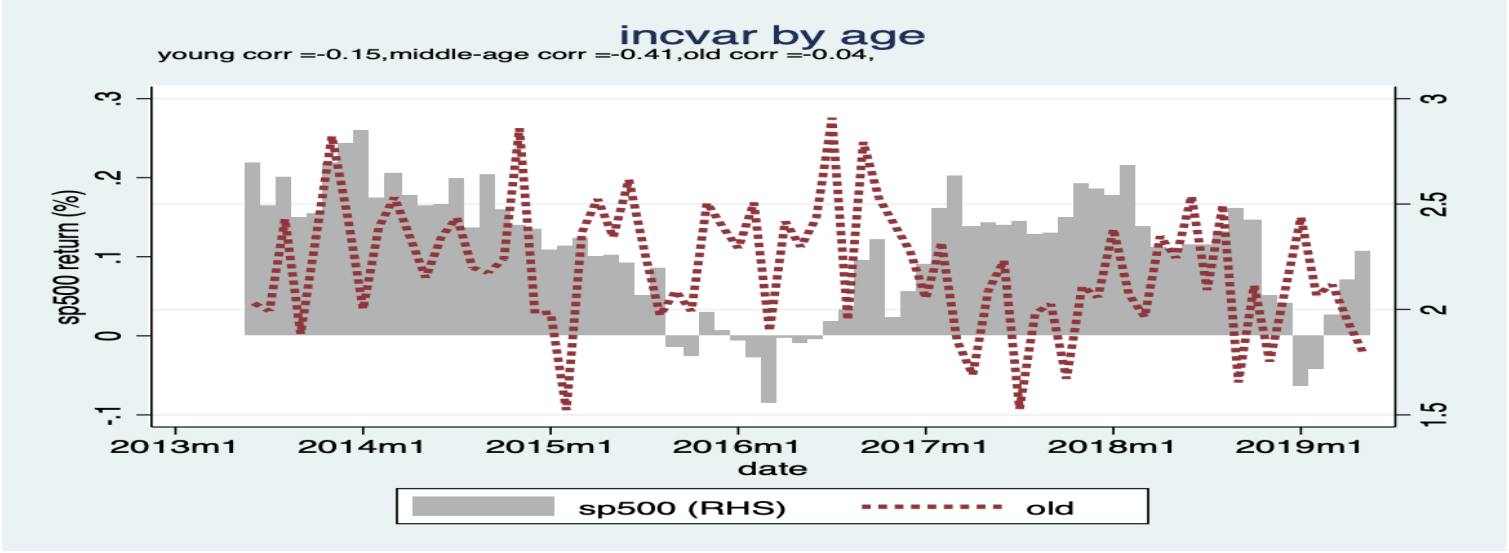
leads	median:var	median:iqr	median:rvar	median:skew	mean:var	mean:iqr	mean:rvar	mean:skew
0	0.04	0.01	0.08	nan	0.16	0.19	0.05	-0.16
1	-0.02	-0.05	0.06	nan	0.16	0.18	0.07	-0.26**
2	-0.12	-0.14	0.03	nan	0.14	0.14	0.16	-0.31***
3	-0.21*	-0.22*	0.02	nan	0.08	0.05	0.13	-0.35***
4	-0.3**	-0.31**	-0.06	nan	-0.03	-0.07	-0.0	-0.22*
5	-0.29**	-0.31**	-0.22*	nan	-0.07	-0.13	-0.14	-0.14
6	-0.31**	-0.31**	-0.26**	nan	-0.09	-0.17	-0.11	-0.26**
7	-0.4***	-0.41***	-0.39***	nan	-0.21	-0.27**	-0.25**	-0.32***
8	-0.44***	-0.44***	-0.41***	nan	-0.21	-0.31**	-0.25**	-0.3**
9	-0.47***	-0.48***	-0.36***	nan	-0.31**	-0.39***	-0.28**	-0.26**
10	-0.49***	-0.5***	-0.41***	nan	-0.42***	-0.5***	-0.3**	-0.3**
11	-0.51***	-0.51***	-0.4***	nan	-0.41***	-0.51***	-0.29**	-0.25*

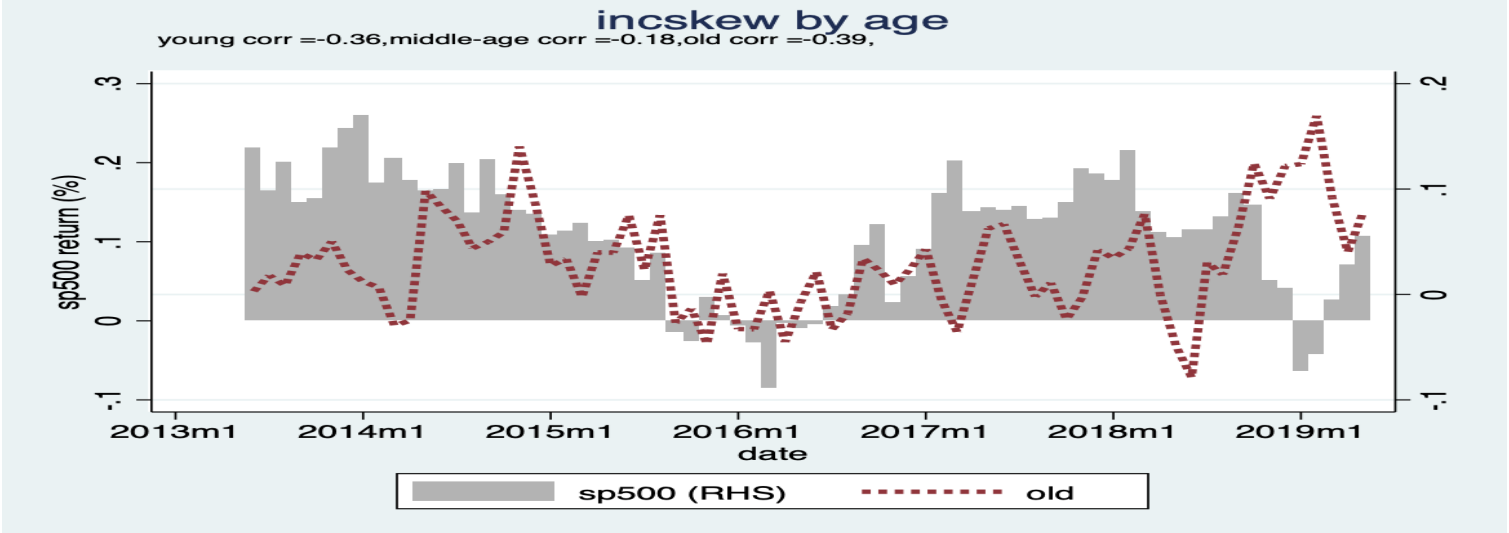
Dispersion risks and stock market performance



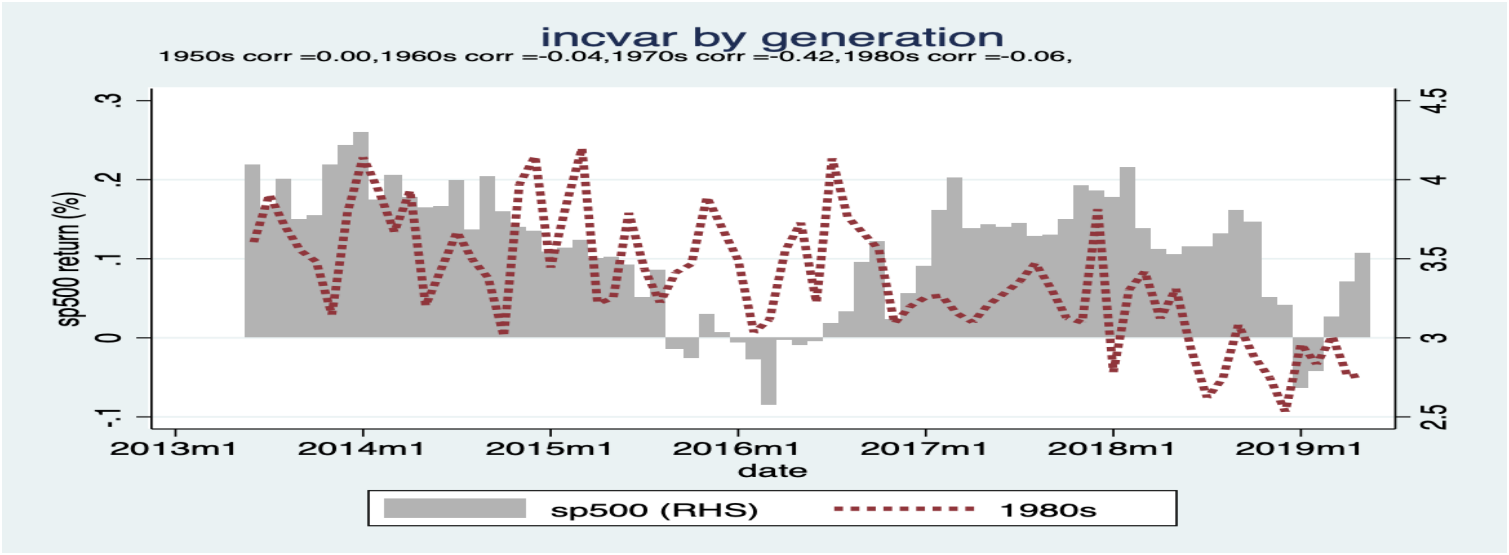


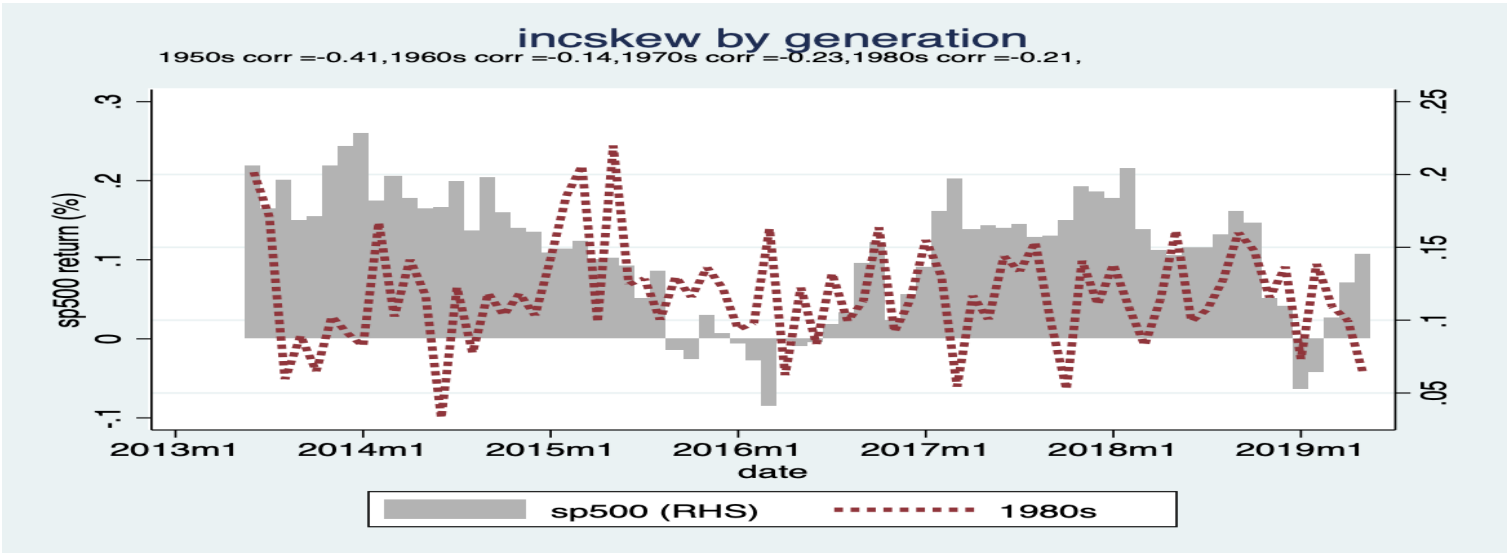
Dispersion risks and stock market performance



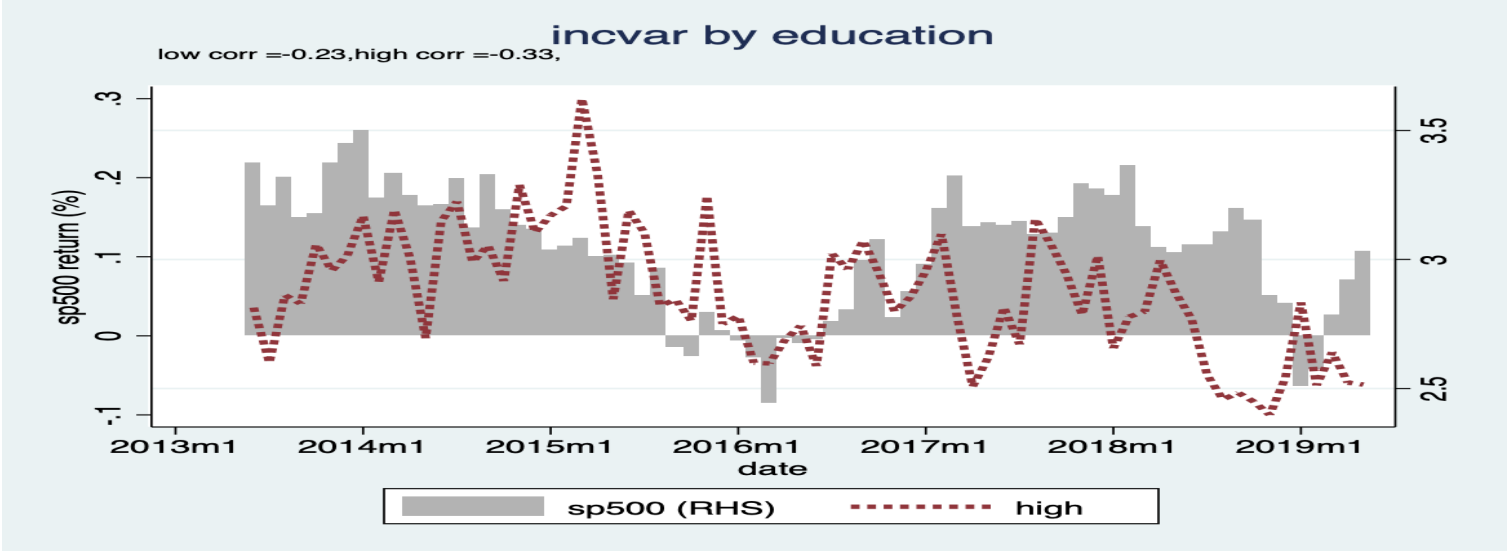


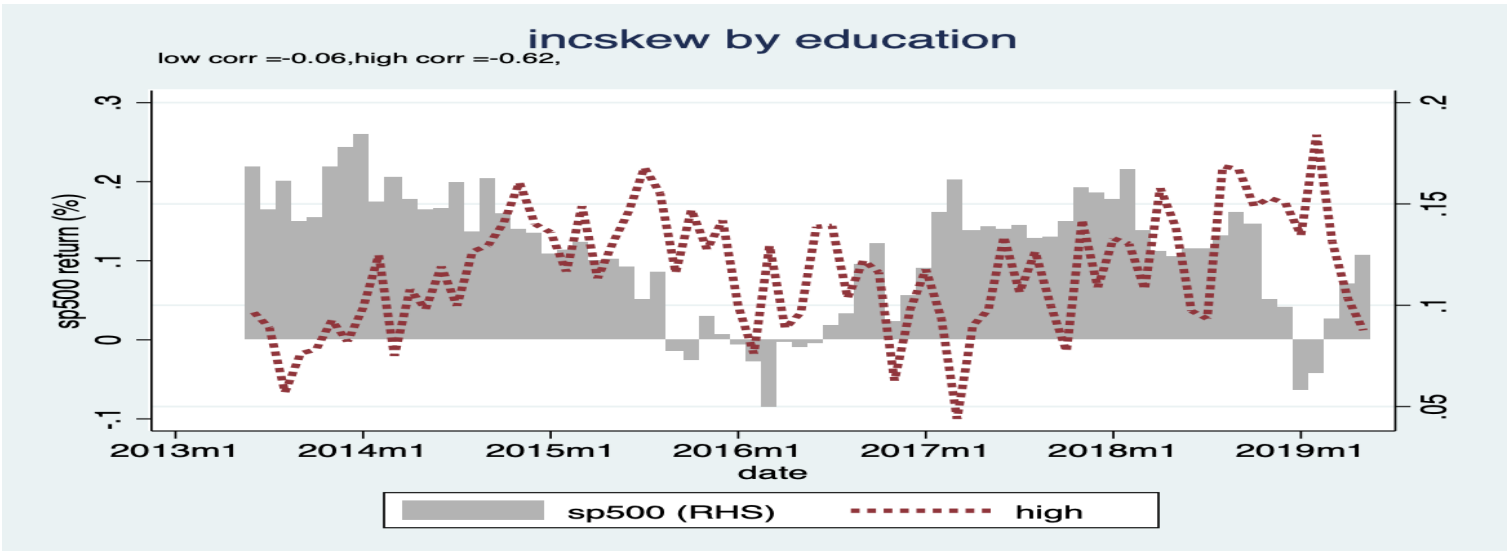
Dispersion risks and stock market performance





Dispersion risks and stock market performance





Outline

Underlying income process

- Income of individual i, cohort c at time t

$$y_{i,c,t} = p_{i,c,t} + \epsilon_{i,c,t}, \quad \text{where } \epsilon_{i,c,t} \sim N(0, \sigma^2_{c,\epsilon})$$
$$p_{i,c,t} = p_{i,c,t-1} + \theta_{i,c,t}, \quad \text{where } \theta_{i,c,t} \sim N(0, \sigma^2_{\theta,c,t})$$
$$\log \sigma^2_{\theta,c,t} = \rho_c \log \sigma^2_{\theta,c,t-1} + \mu_{\theta,c,t}$$
$$\mu_{\theta,c,t} \sim N(0, \gamma^2_c)$$

- Parameters for cohort c
  - ρ_c: how persistent is the innovation to the permanent risk
  - γ_c: how large is the innovation to the size of permanent risk
  - $\sigma_{c,\epsilon}$: the time-invariant size of the transitory risk

Perveived risk for 1-year-ahead growth

- Under a perfect understanding of the income process
- Perceived risks about next-month growth $\Delta y_{i,t}$

$$\begin{aligned}\overline{var_{i,t}}(\Delta y_{i,t+1}) &= E_{i,t}(\sigma^2_{\theta,t+1}) + \sigma^2_\epsilon \\ &= \rho e^{-0.5\gamma}\sigma^2_{\theta,t} + \sigma^2_\epsilon + \underbrace{\omega_{i,t}}_{\text{perception shock}}\end{aligned}$$

- Perceived risks about next-year growth $\Delta Y_{i,t}$

$$\begin{aligned}&\overline{var_{i,t}}(\Delta Y_{i,t+12}) \\ &= \sum_{k=1}^{12}(12-k+1)^2 E_{i,t}(\sigma^2_{\theta,t+k}) + 12\sigma^2_\epsilon \\ &= \sum_{k=1}^{12}(12-k+1)^2 \rho^k e^{-0.5k\gamma}\sigma^2_{\theta,t} + 12\sigma^2_\epsilon\end{aligned}$$

Perceived permanent and transitory decomposition

1. Do GMM estimation using observed perceived risks from the data
   - Using average perceived risks, variance, autocovariance across the whole population or within specified cohort
2. A breakdown of perceived income risks into permanent and transitory components

Model ingredients

1. imperfect understanding of the income process, a deviation from rational expectation benchmark.
   - experience-based learning capturing the cross-generation and age-dependence income perceptions
2. a finite life cycle with a constant probability of death
3. uninsured idiosyncratic risks and aggregate risks (the workhorse assumption of the HANK literature)
4. single asset, i.e. no distinction between liquid and iliquid assets

Intuitions behind the model mechanisms

- an imperfect understanding $\rightarrow$ heterogeneous perception of risks AND uninsurance of risks $\rightarrow$ difference in precautionary motives and MPCs across populations $\rightarrow$ potential amplification of aggregate MPC

Conclusion

- ddddd

Armantier, O., Topa, G., Van der Klaauw, W., and Zafar, B. (2017). An overview of the Survey of Consumer Expectations. *Economic Policy Review*, (23-2):51–72.

Bertrand, M. and Mullainathan, S. (2001). Do people mean what they say? Implications for subjective survey data. *American Economic Review*, 91(2):67–72.

Carroll, C. D., Crawley, E., Slacalek, J., Tokuoka, K., and White, M. N. (2018). Sticky expectations and consumption dynamics. Technical report, National Bureau of Economic Research.

Coibion, O. and Gorodnichenko, Y. (2012). What can survey forecasts tell us about information rigidities? *Journal of Political Economy*, 120(1):116–159.

Delavande, A., Giné, X., and McKenzie, D. (2011). Measuring subjective expectations in developing countries: A critical review and new evidence. *Journal of development economics*, 94(2):151–163.

Engelberg, J., Manski, C. F., and Williams, J. (2009). Comparing the point predictions and subjective probability distributions of

professional forecasters. *Journal of Business & Economic Statistics*, 27(1):30–41.

Flavin, M. A. (1988). The Excess Smoothness of Consumption: Identification and Interpretation. Working Paper 2807, National Bureau of Economic Research.

Fuhrer, J. C. (2018). Intrinsic expectations persistence: evidence from professional and household survey expectations.

Kaufmann, K. and Pistaferri, L. (2009). Disentangling insurance and information in intertemporal consumption choices. *American Economic Review*, 99(2):387–92.

Lian, C. (2019). Consumption with imperfect perception of wealth. Working paper.

Manski, C. F. (2004). Measuring expectations. *Econometrica*, 72(5):1329–1376.

Manski, C. F. (2018). Survey measurement of probabilistic macroeconomic expectations: progress and promise. *NBER Macroeconomics Annual*, 32(1):411–471.

Meghir, C. and Pistaferri, L. (2011). Earnings, consumption and life cycle choices. In *Handbook of labor economics*, volume 4, pages 773–854. Elsevier.

Pistaferri, L. (2001). Superior information, income shocks, and the permanent income hypothesis. *Review of Economics and Statistics*, 83(3):465–476.

Rozsypal, F. and Schlafmann, K. (2017). Overpersistence bias in individual income expectations and its aggregate implications.