

# Perceived Income Risks

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# 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 differences
  - build it in a structural heterogeneous-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:  $skew_{i,t}(\Delta Y_{i,t+12})$
- Both perceived nominal and real income growth
  - $E_{i,t}(\Delta Y_{i,t+12}^r) = E_{i,t}(\Delta Y_{i,t+12}^n) - E_{i,t+12}(\pi_{t+12})$
  - $\overline{var}_{i,t}(\Delta Y_{i,t+12}^r) = \overline{var}_{i,t}(\Delta Y_{i,t+12}^n) + \overline{var}_{i,t}(\pi_{t+12})$
- Conditional on employment
  - Can be converted into the unconditional risk using perceived unemployment risk ( same-job-hour risk is just a lower bound).

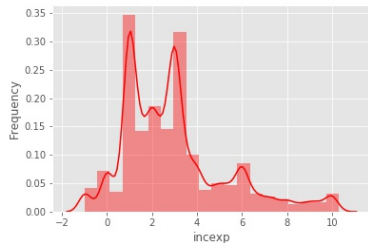
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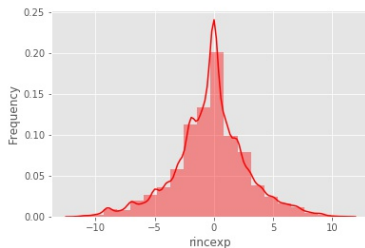


# Cross-sectional distribution of expected income growth

(a) nominal income expectation



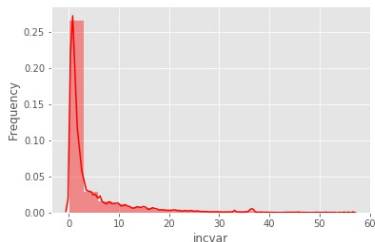
(b) real income expectation



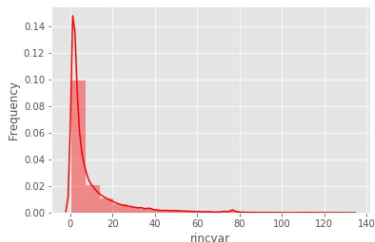
- Nominal rigidity can be seen from the expected nominal earning growth, while real expected growth become symmetric

# Cross-sectional distribution of income dispersion

(a) nominal income risk



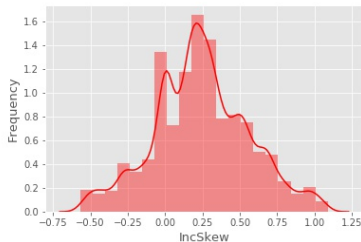
(b) real income risk



- 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

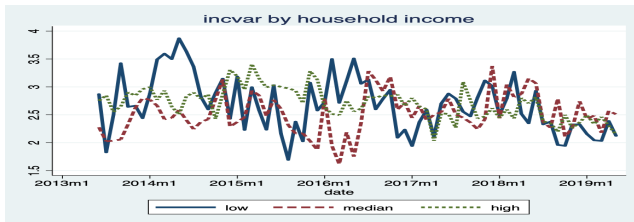
(a) nominal income skewness



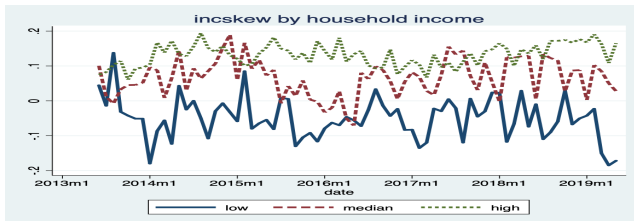
- sizable dispersion in skewness, i.e. about half of the people have non-zero skewness in perceived income distribution.

# Perceived income risks by household income

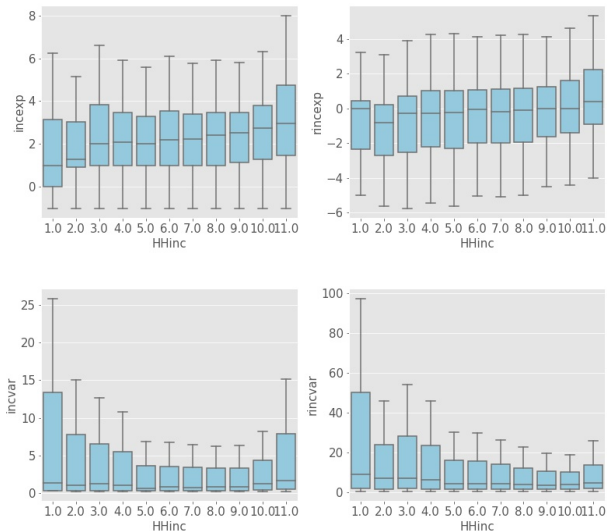
(a) income risks



(b) skewness

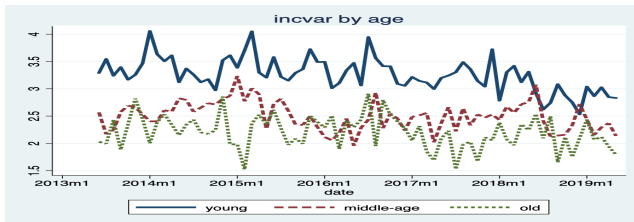


# Perceived income risks by household income

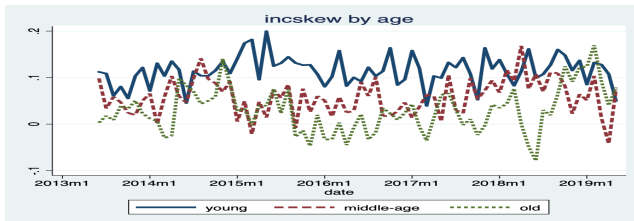


# Perceived income risks by age

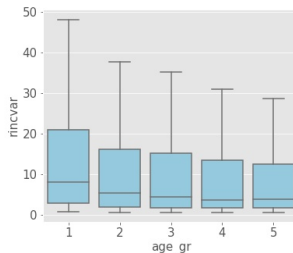
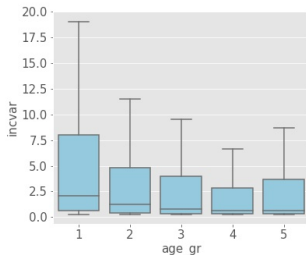
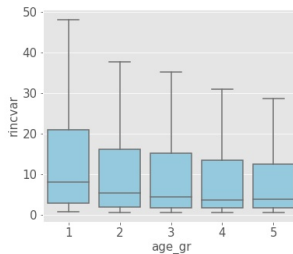
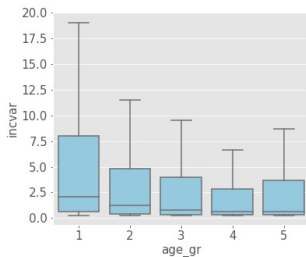
(a) risks



(b) skewness

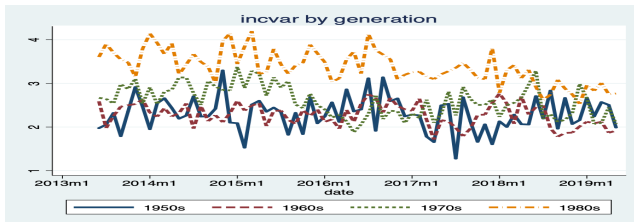


# Perceived income risks by age

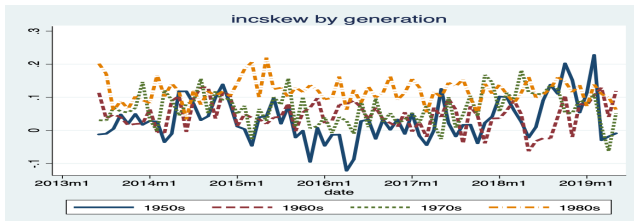


# Perceived income risks by generation

(a) risks

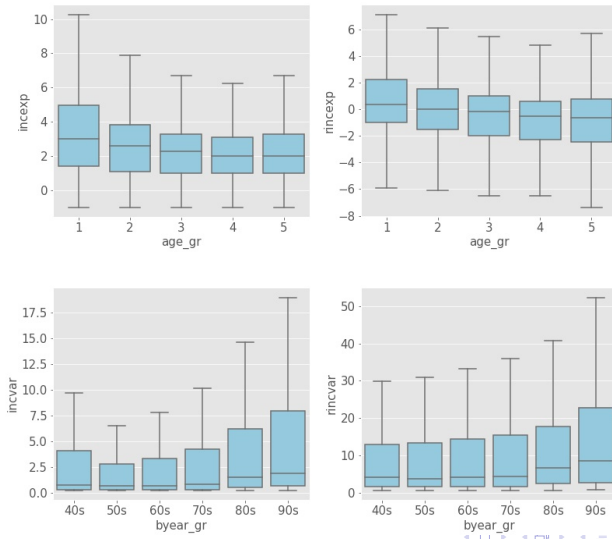


(b) skewness



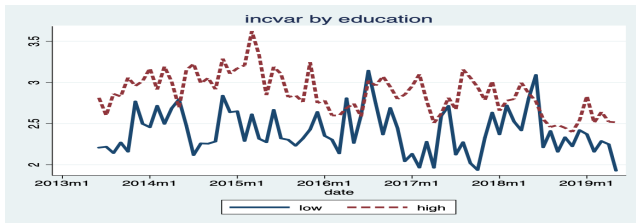


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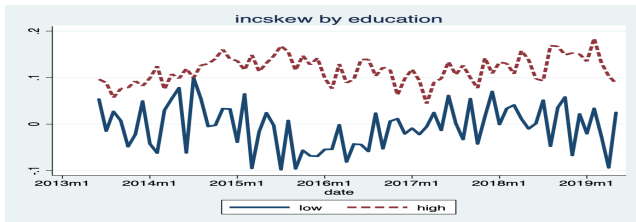


# Perceived income risks by education

(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 (0.02)				-0.39*** (0.03)	
educ_gr=low educ				-0.25*** (0.02)				-0.63*** (0.03)
gender=male				-0.32*** (0.02)				-0.78*** (0.03)
parttime=yes	-0.47*** (0.03)	-0.36*** (0.03)	-0.35*** (0.03)		-0.63*** (0.04)	-0.53*** (0.04)	-0.44*** (0.04)	
selfemp=yes	0.86*** (0.03)	-0.00*** (0.00)	0.00*** (0.00)		0.84*** (0.05)	-0.00*** (0.00)	-0.00*** (0.00)	
Stkprob		0.01*** (0.00)	0.01*** (0.00)			0.02*** (0.00)	0.02*** (0.00)	
UEprobInd		-0.01*** (0.00)	-0.01*** (0.00)			-0.02*** (0.00)	-0.02*** (0.00)	
Intercept	2.82*** (0.01)	2.57*** (0.02)	2.58*** (0.02)	3.05*** (0.02)	-0.29*** (0.02)	-0.92*** (0.03)	-0.80*** (0.03)	0.20*** (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*** (0.10)				7.01*** (0.19)	
educ_gr=low educ				0.40*** (0.11)				3.82*** (0.21)
gender=male				-0.80*** (0.10)				2.76*** (0.19)
parttime=yes	0.05 (0.12)	0.24* (0.13)	-0.12 (0.13)		1.41*** (0.23)	1.81*** (0.26)	0.19 (0.26)	
selfemp=yes	7.21*** (0.15)	-0.00*** (0.00)	-0.00*** (0.00)		6.27*** (0.27)	-0.00*** (0.00)	0.00*** (0.00)	
Stkprob		0.01*** (0.00)	0.01*** (0.00)			-0.05*** (0.00)	-0.05*** (0.00)	
UEprobAgg		0.01** (0.00)	0.00* (0.00)			0.05*** (0.00)	0.04*** (0.00)	
UEprobInd		0.03*** (0.00)	0.02*** (0.00)			0.05*** (0.00)	0.04*** (0.00)	
Intercept	4.64*** (0.05)	3.75*** (0.12)	3.28*** (0.12)	5.72*** (0.07)	12.42*** (0.10)	12.21*** (0.24)	10.16*** (0.25)	11.16*** (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

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# Perceived 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 IIIIII
incexp	0.39*** (0.08)						
rincexp		-0.04* (0.02)					
inevar			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

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# 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*

# Perceived income risks and stock market performance by income

**Table:** Correlation between Perceived Income Risks and Stock Market Return

leads	0	1	2	3	4	5	6	7	8	9	10	11
mean:incvar for low	0.14	0.18	0.21*	0.25**	0.19	0.25**	0.23*	0.16	0.15	0.02	-0.1	-0.08
mean:incvar for high	0.01	0.06	0.06	-0.03	-0.16	-0.19	-0.27**	-0.33***	-0.39***	-0.43***	-0.4***	-0.27**
mean:rincvar for low	0.09	0.16	0.23*	0.28**	0.1	0.17	0.16	0.08	0.15	0.05	-0.0	0.08
mean:rincvar for high	0.13	0.2	0.26**	0.13	0.01	-0.09	-0.1	-0.26**	-0.31**	-0.33***	-0.28**	-0.21
mean:incskew for low	0.33***	0.31***	0.27**	0.28**	0.3**	0.33***	0.13	0.06	0.06	-0.01	-0.02	-0.11
mean:incskew for high	-0.07	-0.2*	-0.32***	-0.28**	-0.18	-0.2	-0.21*	-0.24*	-0.22*	-0.15	-0.23*	-0.19

# Perceived income risks and stock market performance by age

**Table:** Correlation between Perceived Income Risks and Stock Market Return

leads	0	1	2	3	4	5	6	7	8	9	10	11
mean:incvar for young	0.1	0.05	0.03	0.1	0.13	0.21*	0.12	0.05	0.07	-0.03	-0.16	-0.1
mean:incvar for middle-age	0.09	0.16	0.15	0.05	-0.12	-0.12	-0.18	-0.27**	-0.31**	-0.32**	-0.35***	-0.29**
mean:incvar for old	-0.18	-0.15	-0.15	-0.21*	-0.24**	-0.2	-0.14	-0.09	-0.11	-0.19	-0.15	0.0
mean:rincvar for young	0.15	0.11	0.2*	0.22*	0.19	0.23*	0.13	0.05	0.12	-0.0	-0.02	0.01
mean:rincvar for middle-age	-0.03	0.05	0.09	-0.0	-0.2	-0.23*	-0.23*	-0.32**	-0.37***	-0.37***	-0.37***	-0.25*
mean:rincvar for old	0.16	0.21*	0.29**	0.28**	0.19	0.11	0.16	0.1	0.1	0.09	0.12	0.13
mean:incskew for young	0.06	0.04	-0.06	-0.11	-0.07	-0.04	-0.11	-0.23*	-0.21*	-0.14	-0.18	-0.18
mean:incskew for middle-age	0.16	0.03	-0.08	-0.02	0.01	-0.01	-0.03	-0.06	-0.07	-0.07	-0.19	-0.22*
mean:incskew for old	-0.13	-0.13	-0.2	-0.2	-0.1	-0.07	-0.14	-0.14	-0.08	-0.08	-0.07	-0.04

# Perceived income risks and stock market performance by generation

**Table:** Correlation between Perceived Income Risks and Stock Market Return

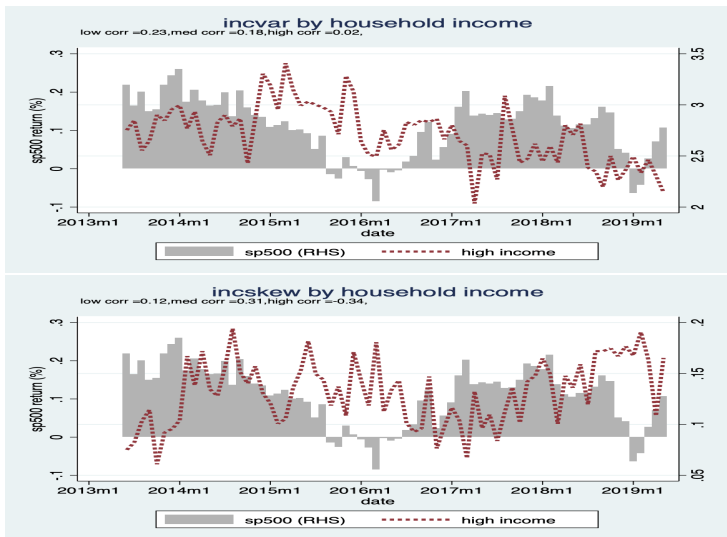
leads	0	1	2	3	4	5	6	7	8	9	10	11
mean:incvar for 50s	-0.08	-0.16	-0.14	-0.17	-0.13	-0.05	0.04	0.1	0.0	-0.13	-0.14	-0.07
mean:incvar for 60s	-0.04	0.09	0.04	-0.05	-0.15	-0.15	-0.16	-0.18	-0.24*	-0.24*	-0.2	-0.09
mean:incvar for 70s	0.16	0.19	0.22*	0.21*	0.06	0.07	-0.07	-0.12	-0.08	-0.1	-0.19	-0.19
mean:incvar for 80s	0.22*	0.17	0.18	0.21*	0.19	0.17	0.18	0.03	0.06	-0.04	-0.14	-0.07
mean:rincvar for 70s	0.02	0.07	0.11	0.13	-0.02	0.0	-0.09	-0.12	-0.09	-0.1	-0.11	-0.07
mean:rincvar for 80s	0.21*	0.13	0.24*	0.19	0.15	0.1	0.09	-0.09	0.01	-0.07	-0.06	-0.04
mean:incskew for 50s	0.01	-0.02	-0.04	-0.06	-0.06	0.0	-0.1	-0.14	-0.0	0.01	0.01	0.01
mean:incskew for 60s	-0.03	-0.07	-0.19	-0.11	0.01	-0.02	-0.0	0.06	0.05	0.02	-0.04	-0.09
mean:incskew for 70s	0.22*	0.16	0.05	0.04	0.09	0.05	-0.0	-0.14	-0.12	-0.06	-0.14	-0.12
mean:incskew for 80s	-0.01	-0.01	-0.08	-0.1	-0.16	-0.11	-0.2	-0.24*	-0.32**	-0.26**	-0.33***	-0.28**

# Perceived income risks and stock market performance by education

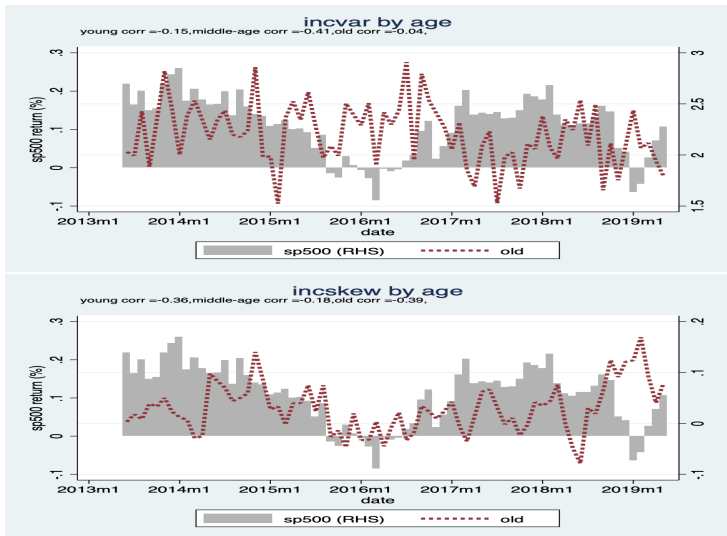
**Table:** Correlation between Perceived Income Risks and Stock Market Return

leads	0	1	2	3	4	5	6	7	8	9	10	11
mean:incvar for low educ	0.06	0.11	0.13	0.1	-0.0	0.05	0.01	-0.08	-0.17	-0.25**	-0.31**	-0.22*
mean:incvar for high educ	0.02	0.04	-0.01	-0.1	-0.21*	-0.22*	-0.27**	-0.3**	-0.21	-0.27**	-0.31**	-0.24*
mean:rincvar for high educ	0.18	0.21*	0.27**	0.2	0.11	-0.05	0.01	-0.05	0.0	-0.06	-0.03	-0.06
mean:incskew for low educ	0.15	0.12	0.02	-0.03	0.05	0.01	-0.09	-0.16	-0.12	-0.16	-0.18	-0.28**
mean:incskew for high educ	-0.03	-0.15	-0.23*	-0.14	-0.1	-0.05	-0.06	-0.11	-0.12	-0.04	-0.14	-0.04

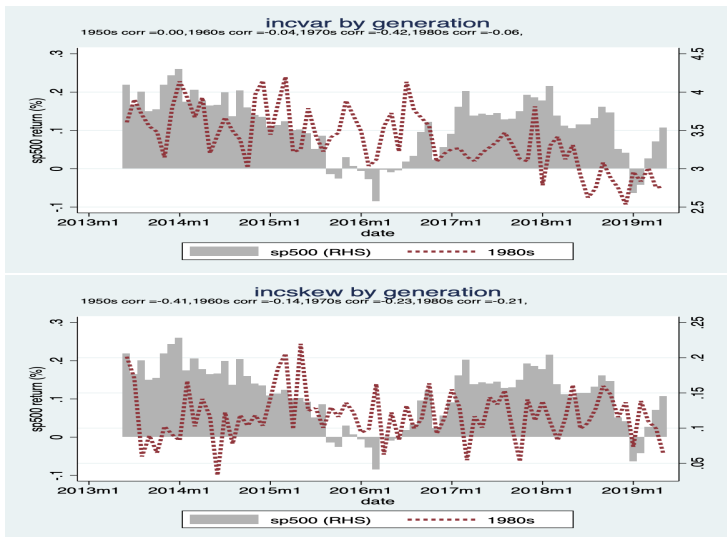
# Perceived correlaton with stock market by income



# Perceived correlaton with stock market by age

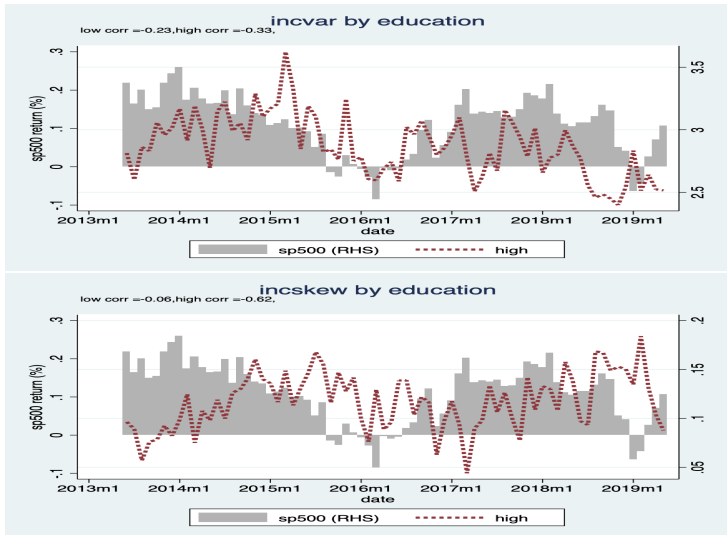


# Perceived correlaton with stock market by generation





# Perceived correlaton with stock market by education



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# Underlying income process

- Income of individual  $i$ , cohort  $c$  at time  $t$

$$y_{i,c,t} = p_{i,c,t} + \epsilon_{i,c,t}, \quad \text{where } \epsilon_{i,c,t} \sim N(0, \sigma_{c,\epsilon}^2)$$

$$p_{i,c,t} = p_{i,c,t-1} + \theta_{i,c,t}, \quad \text{where } \theta_{i,c,t} \sim N(0, \sigma_{\theta,c,t}^2)$$

$$\log \sigma_{\theta,c,t}^2 = \rho_c \log \sigma_{\theta,c,t-1}^2 + \mu_{\theta,c,t}$$

$$\mu_{\theta,c,t} \sim N(0, \gamma_c^2)$$

- Parameters for cohort  $c$

- $\rho_c$ : how persistent is the innovation to the permanent risk
- $\gamma_c$ : how large is the innovation to the size of permanent risk
- $\sigma_{c,\epsilon}$ : the time-invariant size of the transitory risk

# Perceived risk for 1-year-ahead growth

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

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

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

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

# 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

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

# Intuitions behind the model mechanisms

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

# Conclusion

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