Perceived Income Risks

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Outline

1. Motivation

2. Empirical facts
   - Cross-sectional patterns
   - Perceived risks and decisions
   - Correlation with the stock market
   - Permanent/transitory decomposition (work in progress)

3. Model (work in progress)

Motivation

- Risks matter for individual decisions
  - precautionary saving
  - portfolio choice and stock market participation
- Risks matter for macroeconomic outcomes
  - Since idiosyncratic risks are not perfectly insured
  - Different wealth $\rightarrow$ different MPCs $\rightarrow$ distributional channel of macroeconomic policies
- Risks estimated from the inequality $\approx$ "the truth" $\approx$ perceptions?

This paper's agenda

1. **Empirics:** subjective risk profiles from density surveys
   - Cross-sectional profile, i.e. difference across demographic groups
   - Correlation structure with risky asset return
   - Time series property: i.e. how persistent?
   - Implication for decisions
2. **Theory**: a subjective heterogeneous-agent model
   - imperfect understanding of income process
     - i.e. experiences $\rightarrow$ perceptual dfferences across age and generation
   - life-cycle consumption and portfolio choice
   - uninsured idioyncratic risks (and aggregate risks)

Literature

- subjective survey, especially on probabilist surveys. Manski (2004), Delavande et al. (2011), Manski (2018), Bertrand and Mullainathan (2001), Armantier et al. (2017)
- "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 under 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
- counter-cyclical labor income risks: Storesletten et al. (2004), Guvenen et al. (2014), Catherine (2019)
- heterogeneous-agent New Keyesian models (HANK)

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, gender, state

- density estimation following Engelberg et al. (2009)
- exclude top and bottom 1% values of each moment

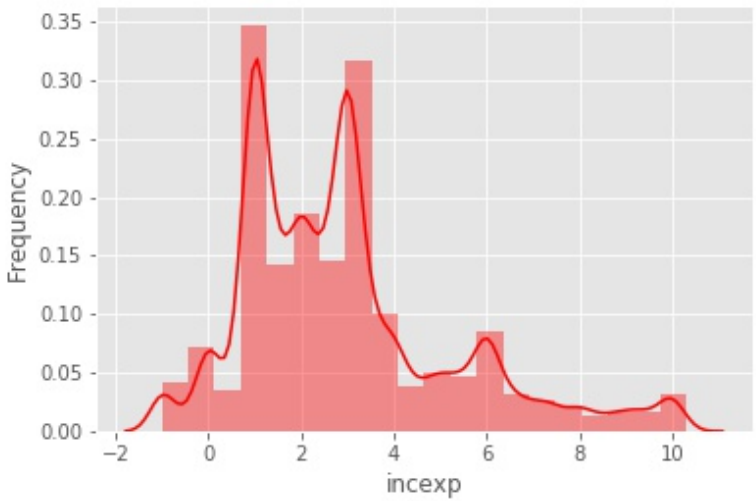
Definition

- $\Delta Y_{i,t+12}$: the next-year income growth of the same job/position/hours, seperate from unemployement risk
- Moments of interest
  - expected growth, $\exp_{i,t} = E_{i,t}(\Delta Y_{i,t+12})$
  - variance: $\overline{var}_{i,t}(\Delta Y_{i,t+12})$
  - iqr: $\overline{iqr}_{i,t}(\Delta Y_{i,t+12})$
  - skewness: $\overline{skew}_{i,t}(\Delta Y_{i,t+12})$
- Nominal and real income growth
  - $\text{rexp}_{i,t} = E_{i,t}(\Delta Y^r_{i,t+12}) = E_i(\Delta Y^n_{i,t+12}) - E_{i,t+12}(\pi_{t+12})$
  - $\overline{rvar}_{i,t} = \overline{var}_{i,t}(\Delta Y^n_{i,t+12}) + \overline{var}_{i,t}(\pi_{t+12})$

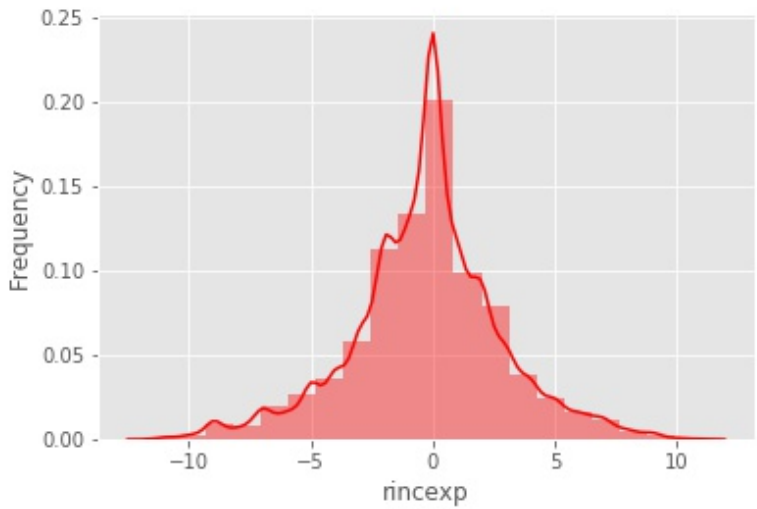
Outline

Cross-sectional of income growth expectation

(a) expected growth of nominal



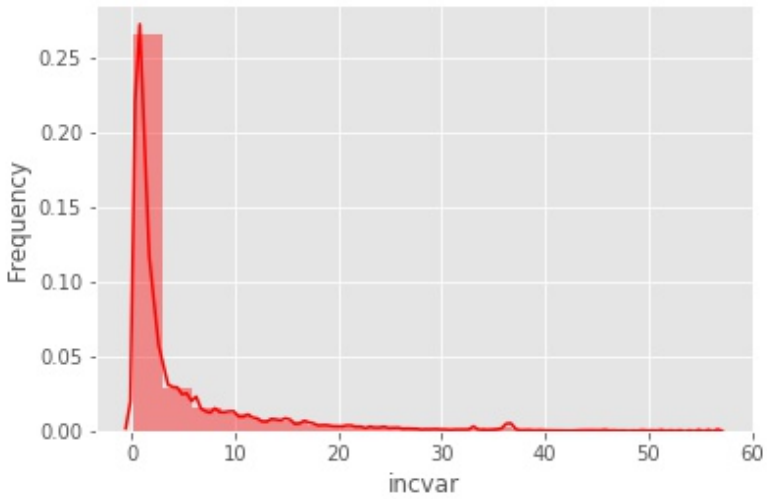
(b) expected growth of real



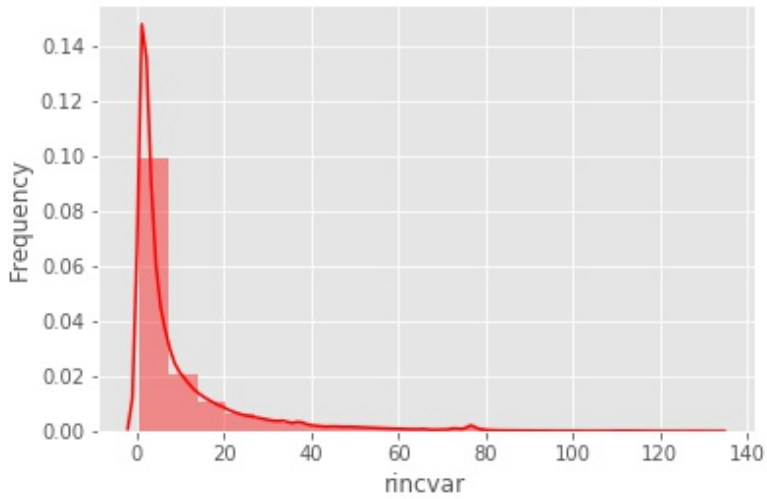
- nominal income: right-skewed and mostly positive
- real income: symmetric around zero

Cross-section of income risks

(a) nominal income risk



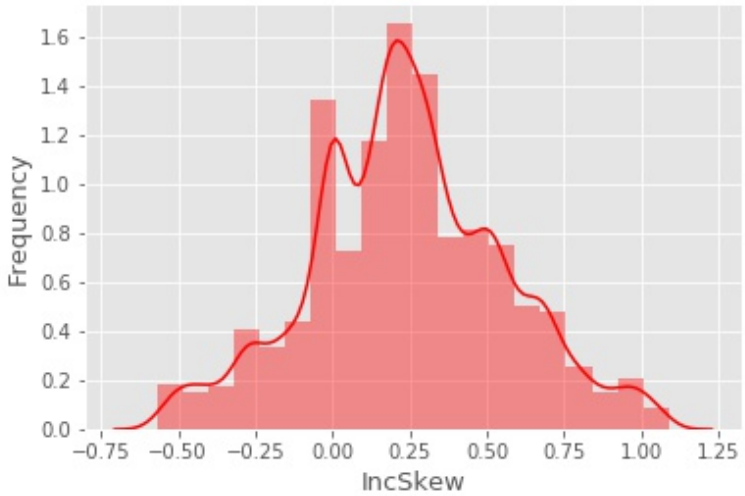
(b) real income risk



- average: 2.5% standard deviation for nominal and 3.5% standard deviation for real income

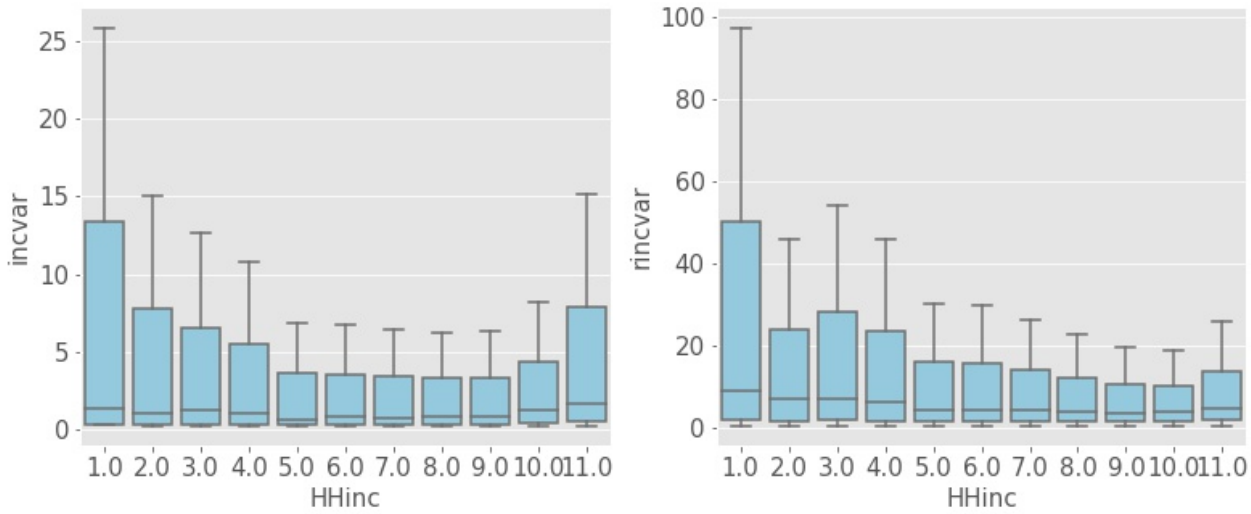
Cross-section of skewness (tail risks)

(a) nominal income skewness



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

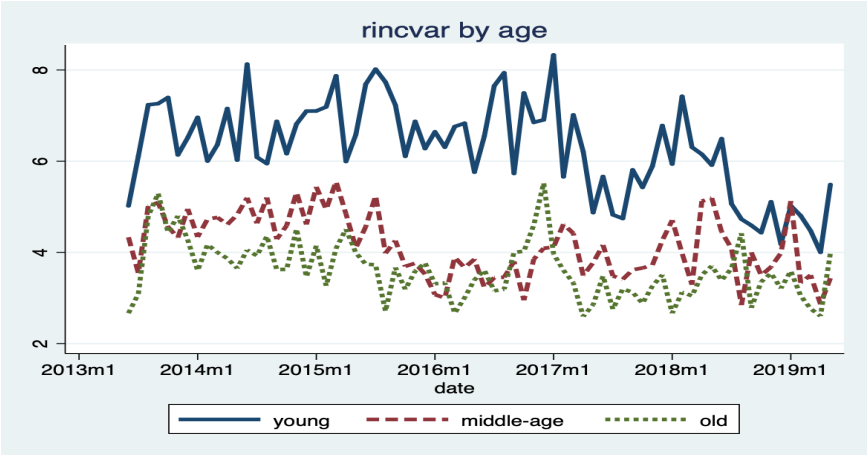
Perceived risks by household income



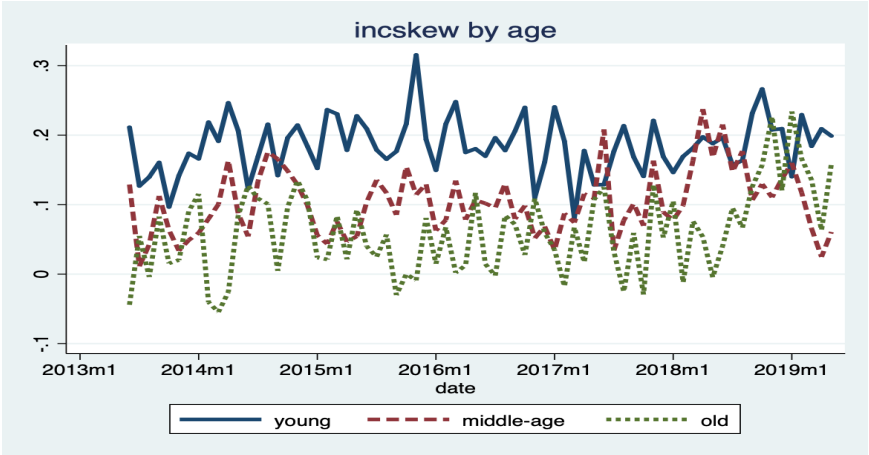
- Similar to the pattern of earning growth dispersion conditional on income in Bloom et al. (2018).

Perceived risks by age

(a) risks



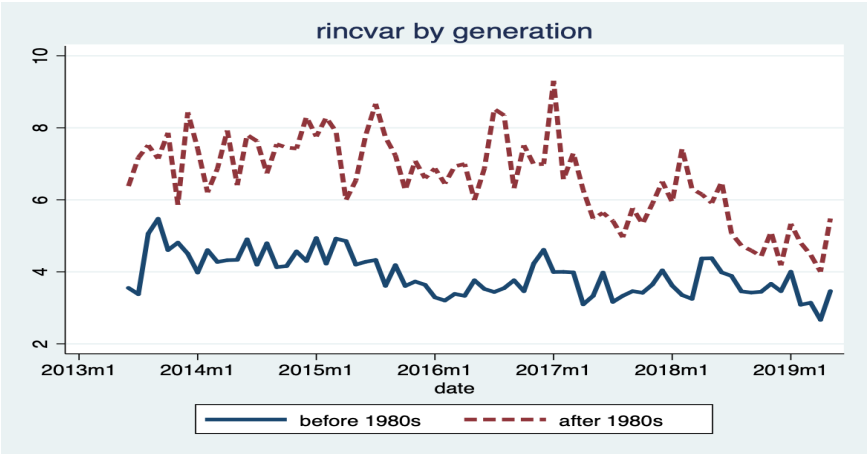
(b) skewness



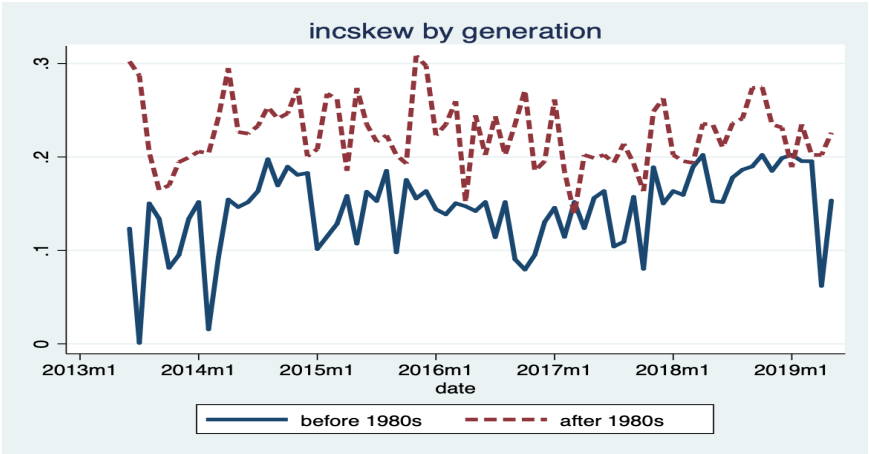
- in line with existing findings, for instance Bloom et al. (2018).

Perceived risks by generation

(a) risks

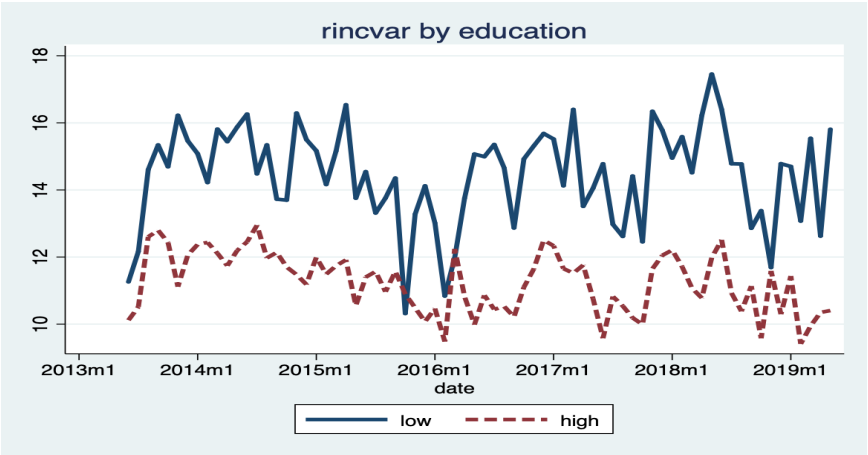


(b) skewness

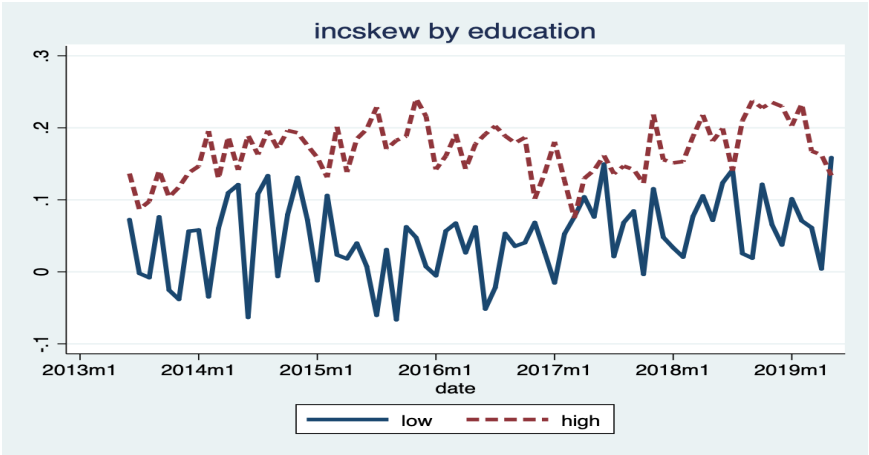


Perceived risks by education

(a) risks



(b) skewness



- not the same to some other findings, for instance Meghir and Pistaferri (2004)

Covariants of perceived 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)	
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

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3. Model (work in progress)

Perveived risks and household spending

$$E_{i,t}(\Delta C_{i,t+12}) = u_0 + u_1 \overline{\text{risks}}_{i,t}(\Delta Y_{i,t+12}) + \xi_{i,t}$$

	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

- Higher perceived risks → higher expected spending growth.

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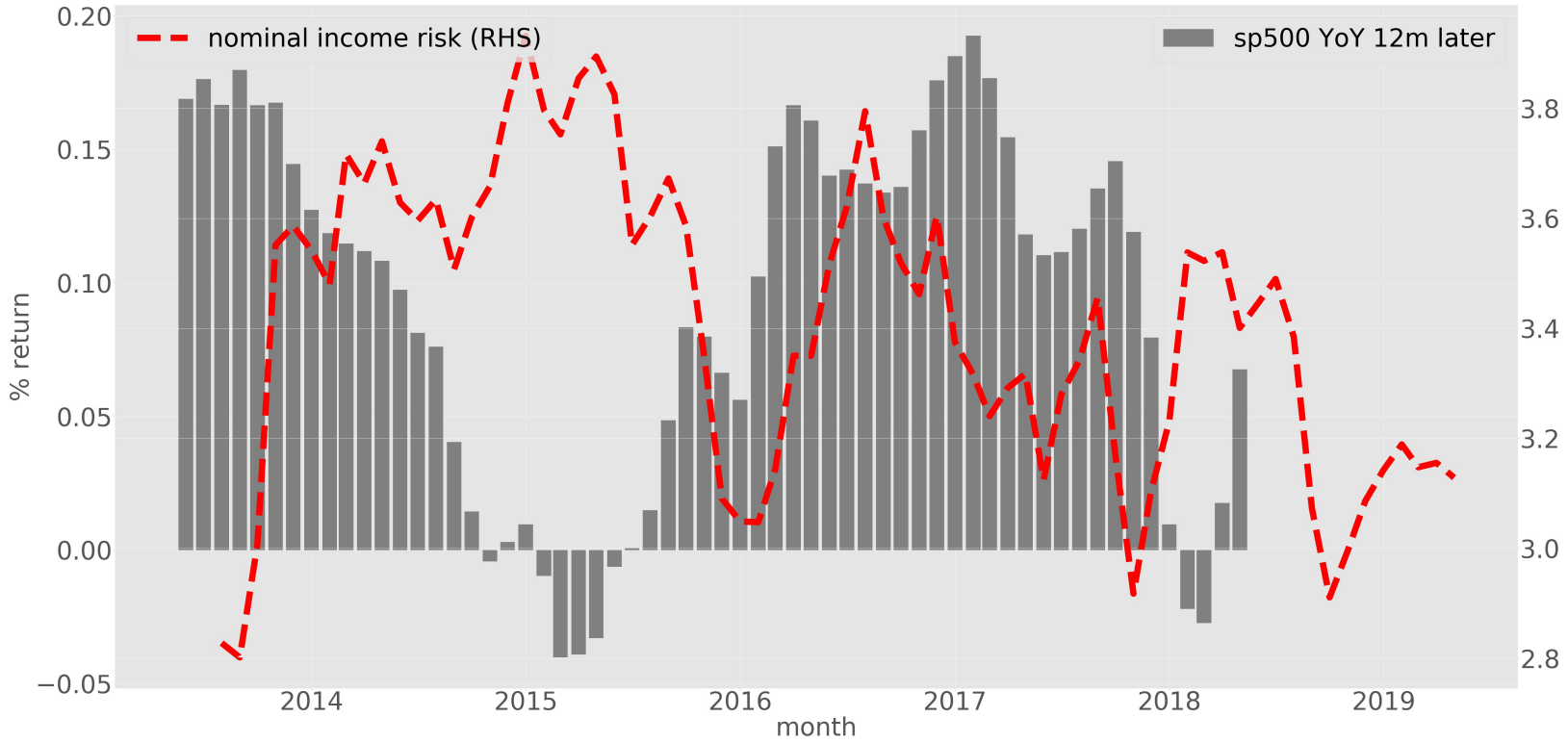
Perceived risks and expected stock performance

$$\overline{\text{risk}_{i,t}} = a_0 + a_1 \underbrace{Stkprob_{i,t}}_{\text{probability of stock market goes up next year}} + \eta_{i,t}$$

	incvar	rincvar	inciqr	incskew
Stkprob	0.014***	-0.018***	0.005***	0.001***
	(0.002)	(0.004)	(0.000)	(0.000)
Constant	2.793***	9.616***	1.821***	0.078***
	(0.087)	(0.178)	(0.022)	(0.005)
N	30121	30121	30121	30121
r2	0.002	0.001	0.005	0.002

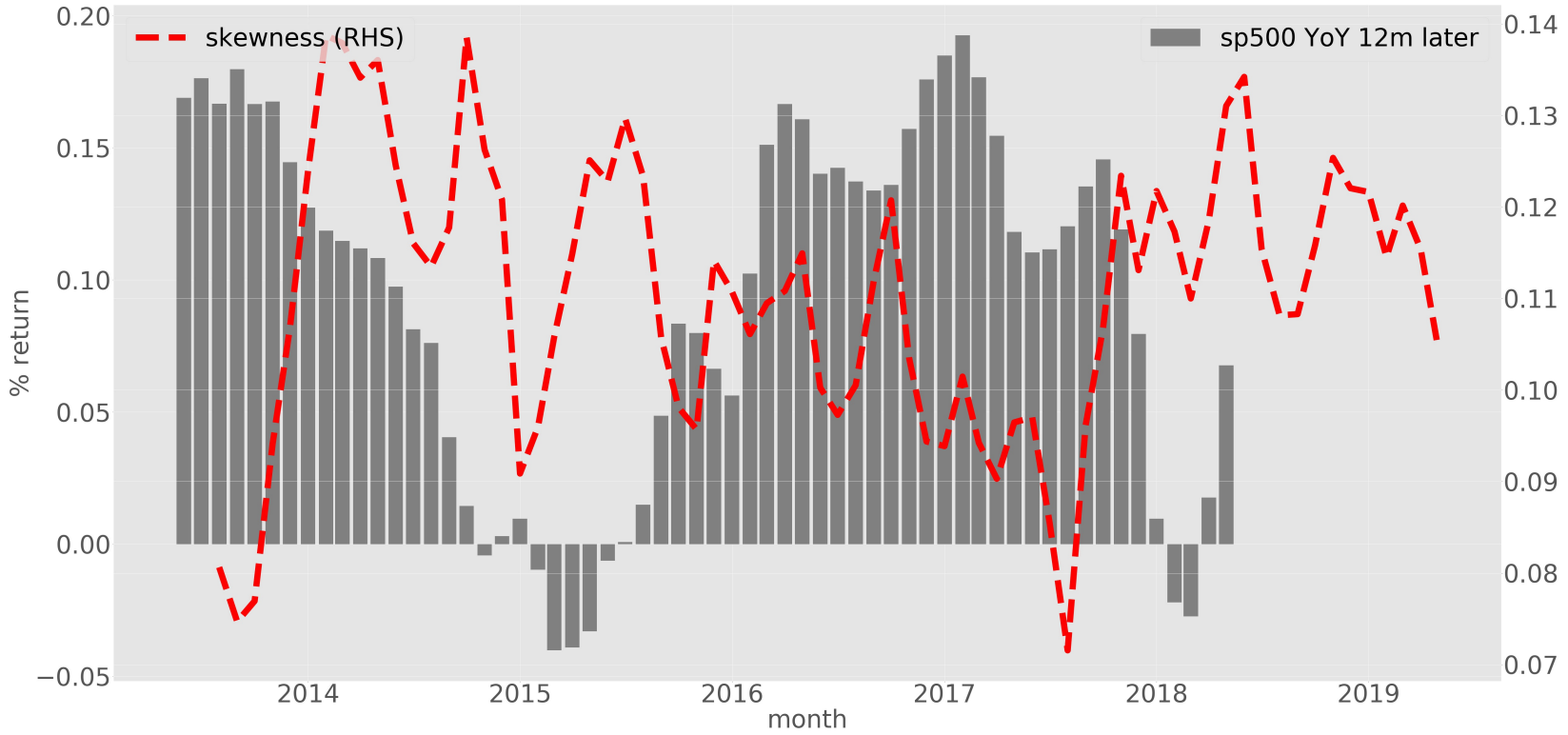
Perceived risks and stock market performance

- $\overline{\text{var}_t}$
- $log(\text{sp500}_{t+12}) - log(\text{sp500}_t)$



Perceived skewness and stock market performance

- $\overline{\text{skew}_t}$
- $log(\text{sp500}_{t+12}) - log(\text{sp500}_t)$



Perceived risks and stock market performance

$$\underbrace{\overline{\text{risk}_t}}_{\text{average perceived risk}} = \alpha + \beta \underbrace{(log(\text{sp500}_{t+k}) - log(\text{sp500}_{t+k-12}))}_{\text{stock market return}} + \epsilon_{i,t}$$

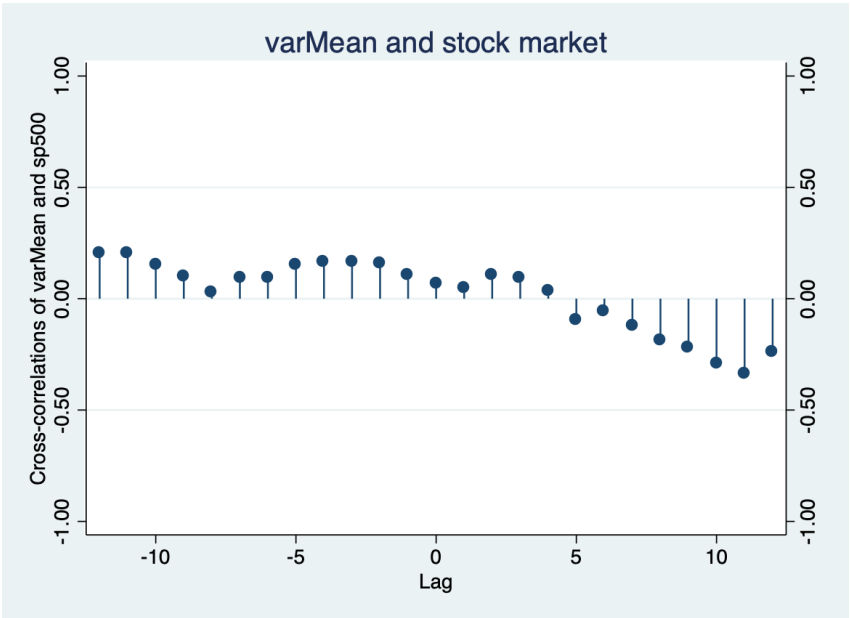
$$\forall k = 1...12$$

# months ahead	varMean	iqrMean	rvarMean	skewMean	varMed	iqrMed	rvarMed	skewMed
1	0.229	0.146	1.509	0.023	-0.061	-0.014	0.457	NA
2	0.517	0.199	2.457	-0.009	-0.13	-0.065	0.74	NA
3	0.469	0.194	3.784**	-0.052*	-0.119	-0.061	0.695	NA
4	0.17	0.112	3.098	-0.051	-0.116	-0.052	0.358	NA
5	-0.472	-0.07	0.701	-0.028	-0.126	-0.027	-0.117	NA
6	-0.275	-0.056	0.057	-0.018	-0.229	-0.122	-0.709	NA
7	-0.63	-0.164	-0.158	-0.049	-0.195	-0.115	-0.959	NA
8	-1.048**	-0.298*	-1.827	-0.076*	-0.279	-0.181	-1.655*	NA
9	-1.239***	-0.368**	-1.886	-0.065**	-0.25	-0.173	-1.689*	NA
10	-1.727***	-0.513***	-2.597*	-0.061**	-0.258	-0.163	-1.489	NA
11	-2.038***	-0.567***	-2.41*	-0.089***	-0.201	-0.113	-1.568*	NA
12	-1.416***	-0.467***	-1.543	-0.088***	-0.267	-0.179	-1.37	NA

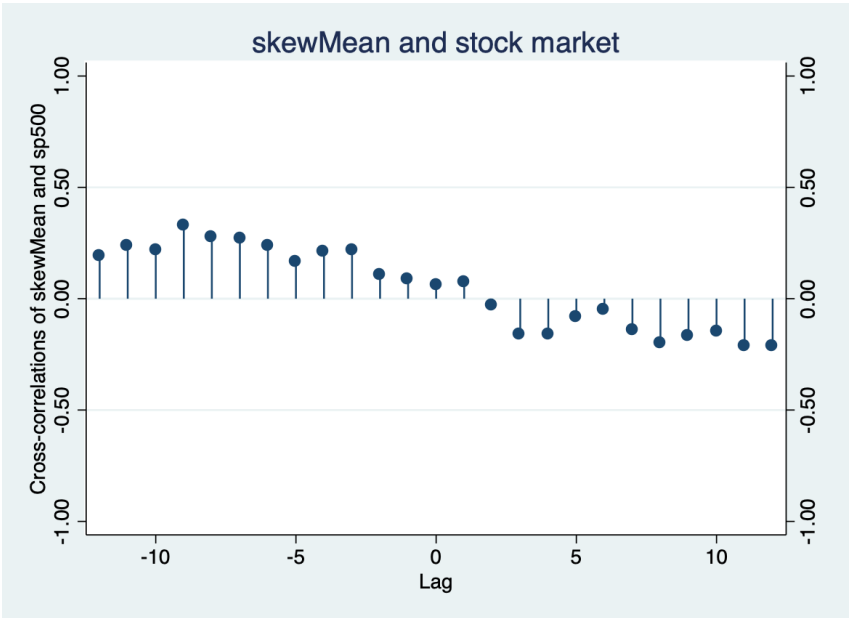
- Newey-west s.e.and bias correction Stambaugh (1999).

Perceived risks and stock market performance

(a) variance and yearly return



(b) skewness and yearly return



Perceived risks and stock market performance

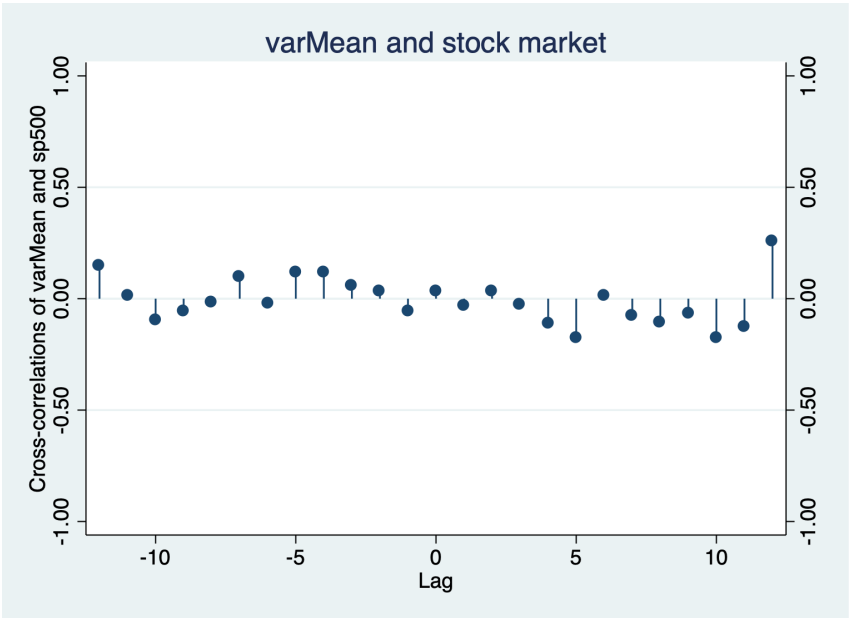
$$\underbrace{\overline{\text{risk}_t}}_{\text{average perceived risk}} = \alpha + \beta \underbrace{(log(\text{sp500}_{t+k}) - log(\text{sp500}_{t+k-1}))}_{\text{stock market return}} + \epsilon_{i,t}$$

$$\forall k = 1...12$$

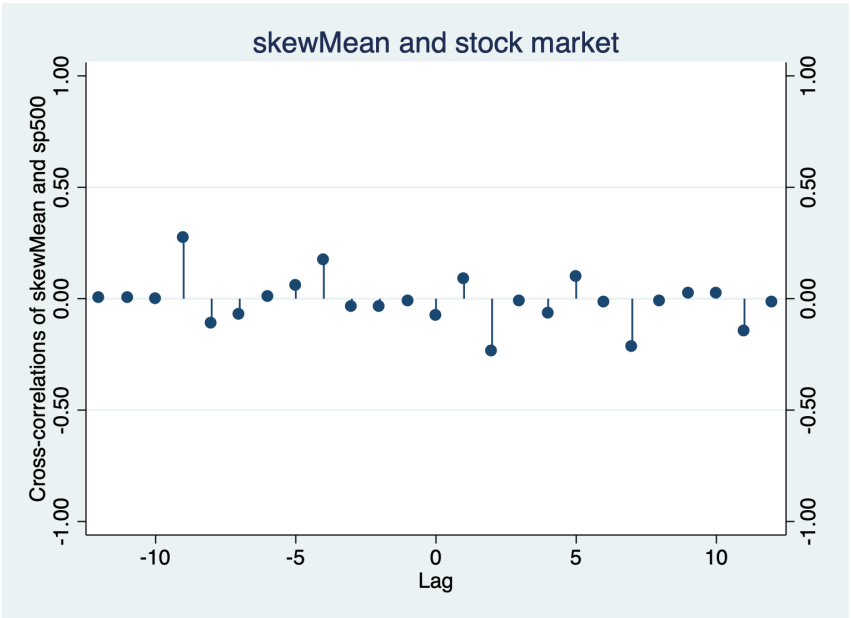
# months ahead	varMean	iqrMean	rvarMean	skewMean	varMed	iqrMed	rvarMed	skewMed
1	-0.387	-0.129	0.711	0.065	-0.341	-0.27	0.161	NA
2	0.423	0.102	3.056	-0.178**	-0.204	-0.176	1.081	NA
3	-0.299	-0.124	4.03	-0.007	-0.261	-0.162	-0.886	NA
4	-1.405	-0.397	-1.763	-0.053	-0.084	0.026	-0.979	NA
5	-2.249	-0.55	-8.515**	0.079	0.15	0.218	-0.723	NA
6	0.218	0.009	-1.339	-0.015	-0.304	-0.308	-2.202	NA
7	-0.95	-0.433	-0.738	-0.174*	-0.236	-0.182	-2.189	NA
8	-1.36	-0.431	-4.698	-0.01	-0.202	-0.169	-2.138	NA
9	-0.889	-0.199	-1.114	0.021	0.105	0.069	0.256	NA
10	-2.347	-0.597	-2.284	0.02	0.163	0.162	0.927	NA
11	-1.641	-0.398	-1.282	-0.126	0.103	0.06	-1.841	NA
12	3.55**	0.708*	5.111	-0.016	-0.22	-0.144	1.21	NA

Perceived risks and stock market performance

(a) variance and monthly return



(b) skewness and monthly return



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

From monthly to yearly

- Assuming the agent understands the process
- Perceived risks about next-month growth $\Delta y_{i,t}$

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

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

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

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

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.

Bloom, N., Guvenen, Fatih, P. L., Sabelhaus, J., Salgado, S., and Song, J. (2018). The great micro moderation. Working paper.

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.

Catherine, S. (2019). Countercyclical Labor Income Risk and Portfolio Choices over the Life-Cycle. SSRN Scholarly Paper ID 2778892, Social Science Research Network, Rochester, NY.

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.

Guvenen, F., Ozkan, S., and Song, J. (2014). The nature of countercyclical income risk. *Journal of Political Economy*, 122(3):621–660.

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. (2004). Income variance dynamics and heterogeneity. *Econometrica*, 72(1):1–32.

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.

Stambaugh, R. F. (1999). Predictive regressions. *Journal of Financial Economics*, 54(3):375–421.

Storesletten, K., Telmer, C. I., and Yaron, A. (2004). Cyclical dynamics in idiosyncratic labor market risk. *Journal of political Economy*, 112(3):695–717.