Updating behavior of inflation expectations: evidence from Japanese household panel data

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Motivation of this study

- The role of "expectations" in the economy has been highlighted: around the beginning the Abe administration (since fall 2012)
- Expectations matter for the agents' decision making- household consumption/saving, labor supply, firms' price setting etc.
- However, their formation process is not clear or hard to be modelled. Further, difficult to be linked to the real economy.
- Availability of a micro-level dataset was limited- recent studies based on the Michigan Survey
- What is missing from the literature

  ✓ Updating behavior of expectations

  (Empirical observation: HHs do not update their forecasts in a systematic manner, although new info. is available.)

  ✓ Accuracy of expectations (whether they are convergent or not)

  (Empirical observation: HHs update their forecasts in a random manner (?). Plus, they always disagree to a substantial extent.)

Theoretical motivation

- **Two theoretical models on information rigidity**

① **Sticky-information model** (Mankiw and Reis (2002))

- information about the economic conditions diffuses only sluggishly among the population (probability of not acquiring new information = information rigidity)
- this happens because of information acquisition cost or re-optimization cost.

② **Noisy-information model** (Mackowiak and Wiederholt (2009))

- agents receive information every period
- forecasts are weighted average of agents' prior beliefs and new information (weight of the prior beliefs = information rigidity)
- because of limited attention and time, they can never fully observe the true state→ decide the level of "inattention".

This study

- Testing the null hypothesis of full-information rational expectations (FIRE)
- Empirical specification based on the two theoretical models

✓ Baseline: this relates ex-post forecast errors to ex-ante revisions in the inflation expectations (Coibion and Gorodnichenko (2012))

✓ Four hypotheses on rational inattention (Drager and Lamla (2013)):

① Greater volatility of inflation → more frequent updates of expectations

② Greater volatility of inflation → more accurate expectations

③ Greater volatility of inflation → smaller response of forecast errors

④ Greater volatility of inflation → greater response of expectations

Brief overview of two models (1)

- Sticky-information model

$$F_t x_{t+h} = (1-\delta)E_t x_{t+h} + \delta F_{t-1} x_{t+h}.$$

δ: probability HHs do not update their information set (=indicator of information rigidity)

$$x_{t+h} - F_t x_{t+h} = \frac{\delta}{1-\delta}(F_t x_{t+h} - F_{t-1} x_{t+h}) + v_{t+h,t}$$

- Model of rational inattention (Wiederholt (2010))

$$\pi_i^e = E[\pi^{e*}|s_i]$$

π^{e*}: full-information rational expectation

$$\pi^{e*} = \phi x$$

s_i: signal individual HH receives with noise ($s_i = x + \varepsilon_i$).

$\varepsilon_i \sim \mathrm{N}(0, {\sigma_\varepsilon}^2)$ [Note: same variance for all HHs and in any period]

Brief overview of two models (2)

- Model of rational inattention (continued)

HHs' problem of choosing optimal attention level:

$$\min_{\sigma^2_{x|s_i},\kappa>0} E_{x,s_i}\left[\frac{\omega}{2}(\pi_i^e - \pi^{e*})^2\right] + \mu\kappa$$

$$\text{s.t.} \quad \frac{1}{2}\log_2(2\pi e\sigma_x^2) - \frac{1}{2}\log_2\left(2\pi e\sigma^2_{x|s_i}\right) \leq \kappa$$

Optimal attention level is given by

$$\kappa^* = \begin{cases} \frac{1}{2}\log_2\left(\frac{\sigma_x^2\omega\phi^2 ln2}{\mu}\right) & if \ \left(\frac{\sigma_x^2\omega\phi^2 ln2}{\mu}\right) \geq 1 \\ 0 & otherwise \end{cases}$$

Brief overview of two models (3)

- Model of rational inattention (continued)

$$\pi_i^e = \left(1 - 2^{-2\kappa^*}\right)\phi(x + \varepsilon_i) \quad (1)$$

More attention is devoted to x,

- greater the cost of making mistakes
- greater the variance of realized inflation

From previous slide, volatile inflation leads to higher attention level.

By transforming the above,

$$\pi_i^e - \pi^{e*} = \left(-2^{-2\kappa^*}\right)\phi x + \left(1 - 2^{-2\kappa^*}\right)\phi\varepsilon_i \quad (2)$$

More attention leads to

- convergent forecast errors (approaches to zero)

Overview of the dataset (1)

- Source: Consumer Confidence Survey (Cabinet Office) 2006.4-2013.10 (monthly)
- Rotating panel of 6,720 HHs, each surveyed over 15 consecutive months
- Question: “How do you expect the price level of the goods frequently purchased by your HH to change in one year’s time?” with an instruction that HHs could refer either to “news on inflation” or to “actual price change they noticed when shopping.”
- Response (10 options): (a) decrease by more than 10%, by 5–10%, by 2–5%, or by 0–2%; (b) unchanged; or (c) increase by more than 10%, by 5–10%, by 2–5%, or by 0–2%

Overview of the dataset (2)

- Other data

- Level of realized inflation rate: (a) CPI, (b) CPI by income, (c) CPI by age, (d) CPI by region → take into account of the variation of consumption basket

- Proxy of attention level; (1) Frequency of updates in the previous surveys, (2) Volatility of inflation rate: (a) squared sum of the changes in inflation (realized/professionals' forecasts) during previous 12 months, (b) gap in the average inflation forecast among top 8 and bottom 8 professionals, (c) variance of HHs' expectations for each survey.

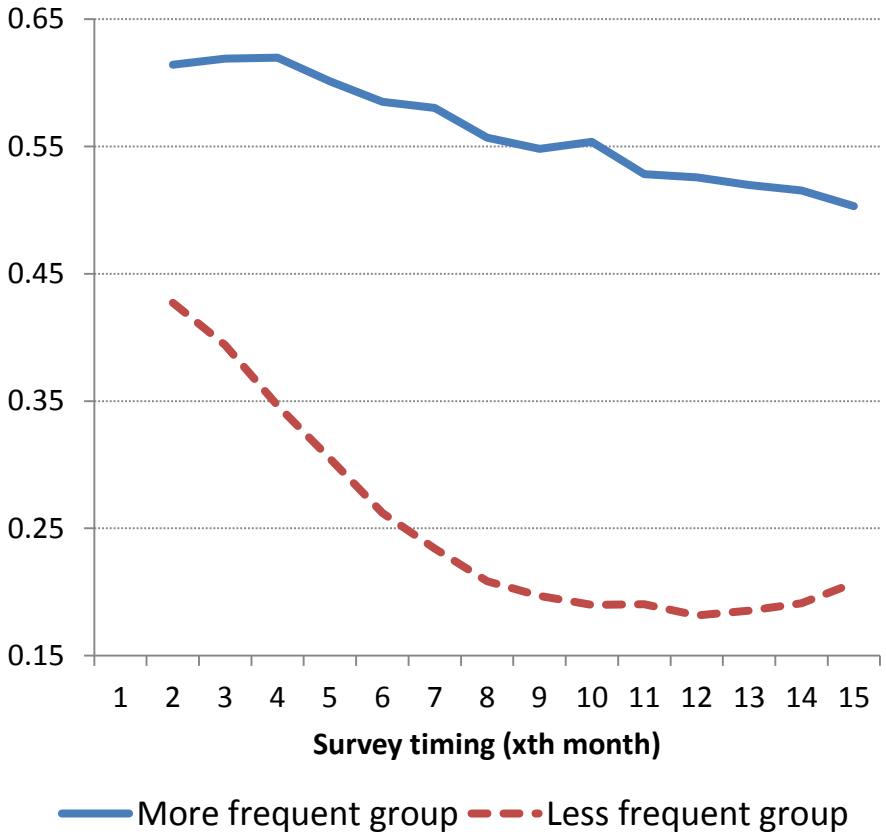
- Grouping by frequency of updates (0-14 times)

- More frequent group (HHs that updated 3+ times)

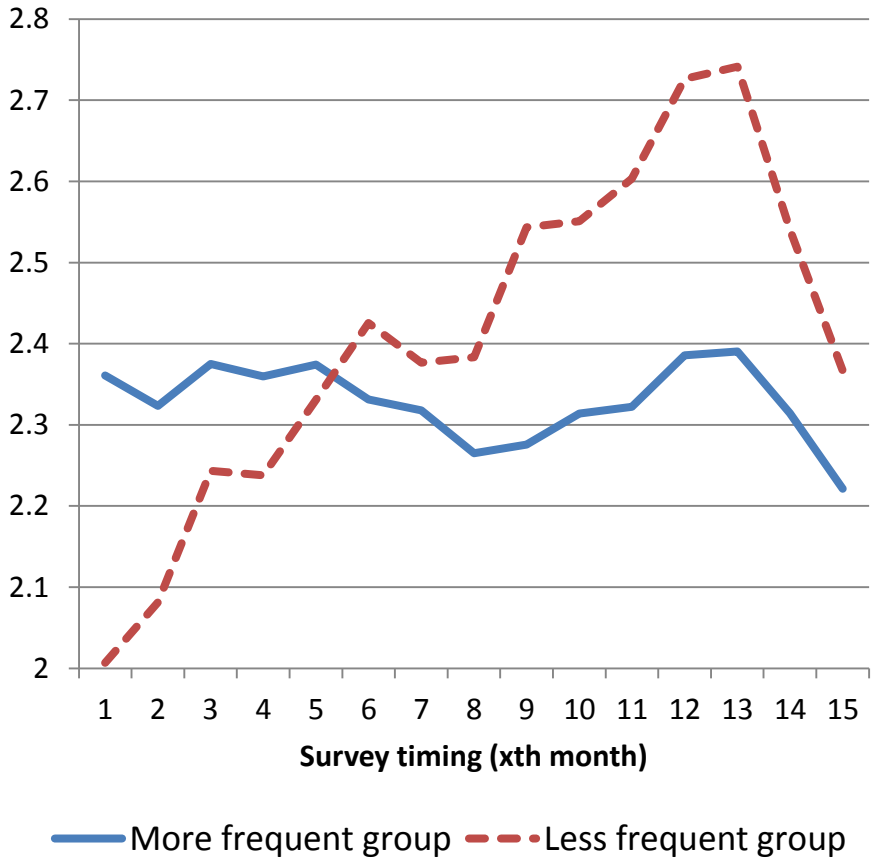
- Less frequent group (HHs that updated 0-3 times)

Overview of the dataset (3)

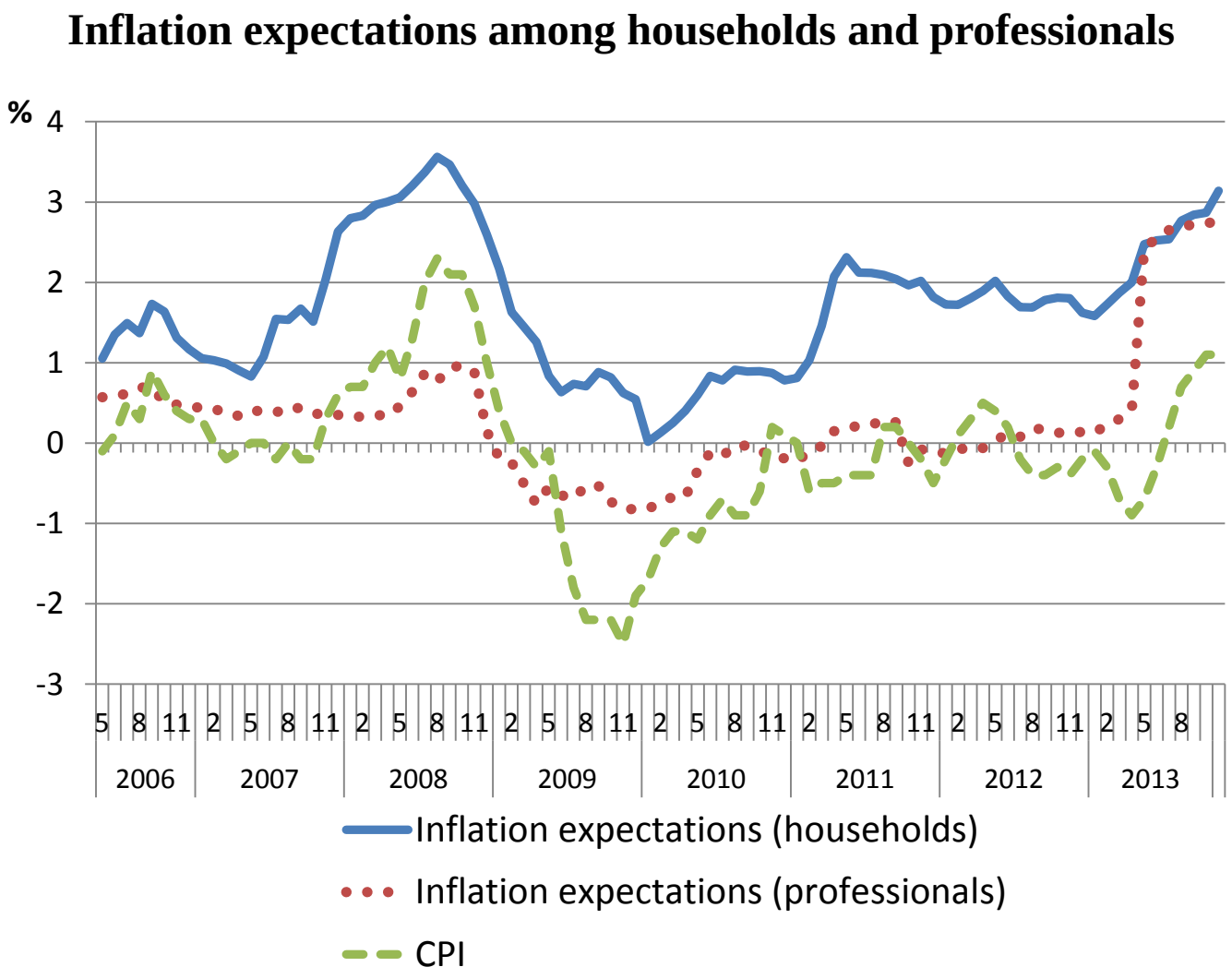
Proportion of households that updated their expectation, by survey month



Average absolute forecast errors (AFEs) by survey month



Overview of the dataset (4)



Test results of information rigidities (1)

$$x_{t+h} - F_t x_{t+h} = \alpha + \beta(F_t x_{t+h} - F_{t-1} x_{t+h-1}) + \varepsilon_{t+h,t}$$

- ✓ β is expected to be positive ($\frac{\delta}{1-\delta}$ in the sticky-information model), and is estimated to be positive → $\delta \approx 0.69$ →→ HHs update their information once every 3.24 months (more frequent than the previous studies)
- ✓ IV regression via GMM, because of the possible persistence in error term
- ✓ IV = contemporaneous innovations in gasoline prices

	(1)	(2)	(3)	(4)
Forecast revision $(E_t(\pi_{t+12})-E_{t-1}(\pi_{t+11}))$	2.239	2.269 ***	2.584 ***	2.243 ***
	(3.058)	(0.474)	(0.470)	(0.132)
Constant	-1.700 ***	-1.711 ***	-1.726 ***	-1.718 ***
	(0.184)	(0.030)	(0.030)	(0.011)
N	81	3,807	3,807	330,299
First stage F-statistics	7.16	152.86	156.15	132.72
Wald χ^2	0.39	7.34	62.49	530.90
Prob > χ^2	0.531	0.000	0.000	0.0000
Hansen's J $\chi 2(5)$	-	-	26.01	106.70
Prob > $\chi^2(5)$	-	-	0.001	0.000

Test results of information rigidities (2)

- ✓ As the survey proceeds, the updating frequency decreases; (1) early stage (1st -6th survey month) once in every 2.2 months, (2) latter stage (7th-15th survey month) once in every 4.1 months.

	Households at an early survey stage		Households at a latter survey stage	
	(5)	(6)	(7)	(8)
Forecast revision $(E_t(\pi_{t+12})-E_{t-1}(\pi_{t+11}))$	1.843 ***	1.174 ***	3.096 ***	3.144 ***
	(0.445)	(0.133)	(0.653)	(0.257)
Constant	-1.650 ***	-1.712 ***	-1.793 ***	-1.734 ***
	(0.034)	(0.012)	(0.037)	(0.019)
N	3,730	141,832	3,485	163,108
First stage F-statistics	14.96	61.56	20.82	56.81
Wald $\chi^2(4)$	59.92	246.25	83.41	227.25
Prob > $\chi^2(4)$	0.000	0.000	0.000	0.000
Hansen's J $\chi 2(5)$	6.25	115.87	9.30	27.11
Prob > $\chi^2(5)$	0.100	0.000	0.026	0.000

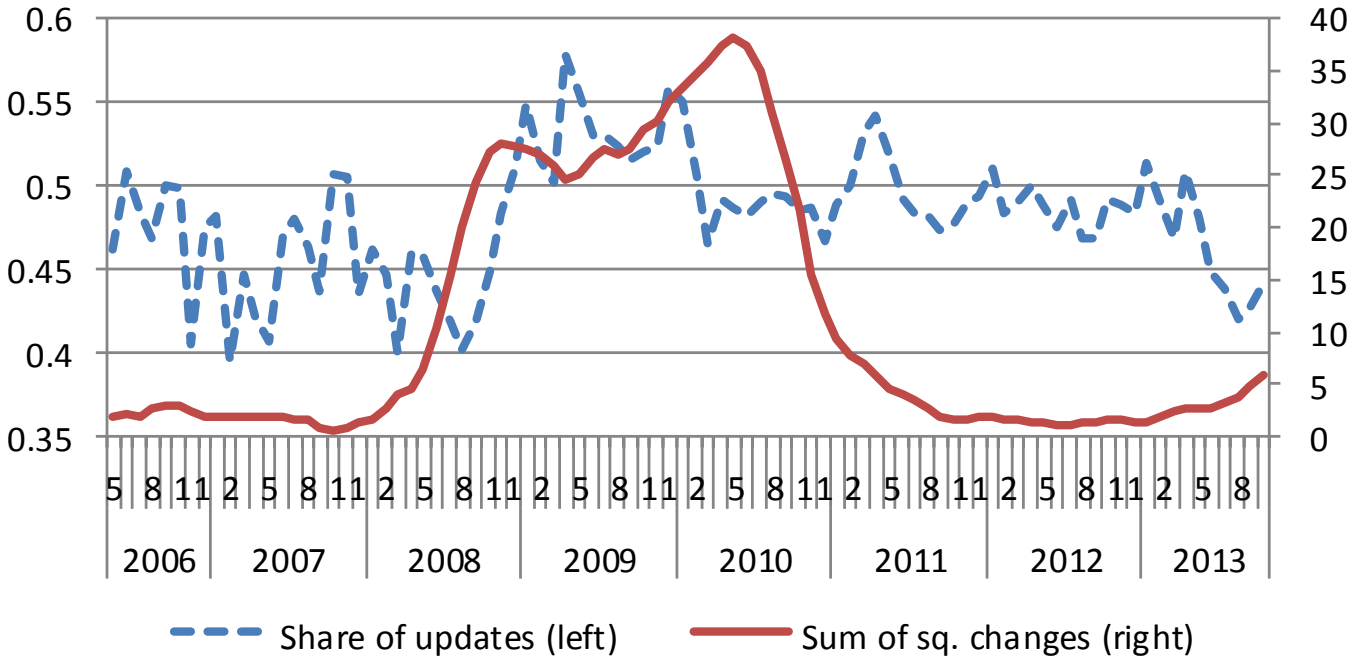
Probability of updating expectations (1)

- Hypothesis: Greater volatility in expectations under FIRE increases the probability of updating.

$$y_{it} = \begin{cases} 1 & if\ y_{it}^* > 0 \\ 0 & if\ y_{it}^* \leq 0' \end{cases} \qquad i = 1, \dots, N \quad t = 2, \dots, 15$$

$$y_{it}^* = \alpha + \beta\pi_{t-1} + \gamma\sigma_{t-1} + \delta X_{it} + u_{it}$$

σ_{t-1} is a volatility measure explained in a previous slide.



Probability of updating expectations (2)

- ✓ Consistent results with theory, w.r.t volatility measures (positive)
- ✓ HHs' expectations do not catch up with those of professionals (foreseeing the upcoming increase in the consumption tax rate)
- ✓ Previous errors increase the updating probability

Updating expectations (marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)
π_{t-1}	-0.0199 ***	-0.0193 ***	-0.0176 ***	-0.0210 ***	-0.0273 ***	-0.0390 ***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)
$\sigma^2(\pi_{t-1})$	0.00070 ***					
	(0.000)					
$\sigma^2(\pi^{e,\ professional}_{t-1})$		0.00173 **				
		(0.001)				
$\sigma^2(\pi^{e,\ professional}_{t-1})$* consumption tax dummy		-0.0032 ***				
		(0.001)				
$\sigma^2(\pi^{e,\ household}_{t-1})$			0.0348 ***			
			(0.001)			
Gap($\pi^{e,\ professional}_{t-1}$)				0.0304 ***		
				(0.005)		
Forcast error (lagged)					0.0008	0.0262 ***
					(0.002)	(0.005)
N	370,535	370,535	370,535	370,535	52,821	334,194
Demographic controls	yes	yes	yes	yes	yes	yes
Wald	2062.15	2142.47	2651.97	2065.3	120.41	1348.36
chi2>0	0.000	0.000	0.000	0.000	0.000	0.000

Probability of updating expectations (3)

- Estimation by the direction of updates and by income group
- Previous literature finds that lower-income group is more likely to have higher expectations (low income+ low wealth → future inflation is listed at the top of HHs' concerns → more cautious towards inflation)
- Greater volatility increases the probability of updating in both directions

Updating expectations (marginal effects)

Upwards	3million -	3-4 million	4-5.5million	5.5-7.5 million	7.5-9.5 million	9.5-12 million	12 million+
π_{t-1}	-0.0214 ***	-0.0215 ***	-0.0229 ***	-0.0246 ***	-0.0295 ***	-0.0241 ***	-0.0296 ***
	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.004)
$\sigma^2(\pi_{t-1})$	0.00355 ***	0.00197 ***	0.0013 ***	0.0010 ***	0.0004	0.0004	0.0008 **
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	164,373	77,479	69,161	58,007	34,796	20,663	13,972
Demographic controls	yes	yes	yes	yes	yes	yes	yes
Wald	6363.21	2824.80	2645.99	2088.53	1341.96	797.37	574.79
chi2>0	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Downwards	3million -	3-4 million	4-5.5million	5.5-7.5 million	7.5-9.5 million	9.5-12 million	12 million+
π_{t-1}	-0.0001	0.0022	-0.0005	0.0009	0.0033	0.0027	0.0032
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
$\sigma^2(\pi_{t-1})$	-0.00051 ***	0.00028 **	0.00086 ***	0.00091 ***	0.00093 ***	0.00095 ***	0.00086 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
N	164,373	77,479	69,161	58,007	34,796	20,663	13,972
Demographic controls	yes	yes	yes	yes	yes	yes	yes
Wald	195.6	99.39	110.02	97.89	68.38	29.57	27.36
chi2>0	0.000	0.000	0.000	0.000	0.000	0.000	0.000

AFEs and household attentiveness (1)

- Hypothesis: Greater variance in aggregate shocks on expectations under FIRE leads to a smaller AFEs through higher attention level.
- Estimation (conditional on updates):

$$AFE_{jt} = \alpha + \beta_1 \pi_{t-1} + \beta_2 A_{jt-1} + \gamma X_{jt} + \mu_j + \delta_t + \varepsilon_{jt}$$

- A is either (1) frequency of past updates (A_{jt-1}) or (2) volatility measures (A_{t-1}).
- Expect negative signs for $\beta_2 \rightarrow$ mixed results

	(1)	(2)	(3)	(4)	(5)	(6)
Number of previous updates	-0.0494 ***					
	(0.005)					
Frequency of previous updates		-0.4271 ***				
		(0.044)				
$\sigma^2(\pi_{t-1})$			0.02329 ***			
			(0.000)			
$\sigma^2(\pi^{e,\ professional}_{t-1})$				0.0489 ***		
				(0.005)		
$\sigma^2(\pi^{e,\ household}_{t-1})$					0.3416 ***	
					(0.006)	
$Gap(\pi^{e,\ professional}_{t-1})$						1.8817 ***
						(0.019)
N	168,741	168,741	168,969	168,969	168,969	168,969
Lagged inflation rate	yes	yes	yes	yes	yes	yes
F/Wald	2288.81	2275.76	11848.28	9723.39	12963.27	20682.81
Prob>F/Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000

AFEs and household attentiveness (2)

- Another empirical specification (estimation by income group):

$$AFE_{jt} = \alpha AFE_{jt-1} + \beta A_{jt-1} + \gamma X_{jt} + \mu_j + \delta_t + \varepsilon_{jt}$$

- System GMM
- Results without statistical significance wrt/ A_{jt-1}

	All households	By income						
		3million-	3-4million	4-5.5million	5.5-7.5million	7.5-9.5million	9.5-12million	12million-
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AFE_{jt-1}	-0.335 ***	-0.357 ***	-0.368 ***	-0.316 ***	-0.344 ***	-0.319 ***	-0.305 ***	-0.209 ***
	(0.022)	(0.01)	(0.019)	(0.021)	(0.022)	(0.025)	(0.033)	(0.045)
A_{jt-1}	0.140	-1.322 *	0.922	1.678	-0.340	-0.654	2.167	-1.483
	(1.371)	(0.791)	(1.470)	(1.482)	(1.720)	(1.933)	(2.121)	(2.307)
N	136,482	46,289	24,906	22,306	19,572	11,797	7,085	4,824
Hansen test of over-identification (p-value)	0.341	0.000	0.111	0.624	0.582	0.002	0.775	0.101
Test for first-order serial correlation (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Test for second-order serial correlation (p-value)	0.151	0.102	0.222	0.331	0.875	0.002	0.575	0.320

AFEs and household attentiveness (3)

- Hypothesis: Greater volatility in expectations under FIRE reduces the extent of responses in AFEs to the changes in expectations under FIRE
- Estimation results (conditional on updates) are consistent with this hypothesis.
- Difficult to interpret; whether these smaller responses imply convergence.

	(1)	(2)	(3)	(4)	(5)	(6)
Number of previous updates	-0.0074					
	(0.006)					
Frequency of previous updates		-0.1910 ***				
		(0.055)				
$\sigma^2(\pi_{t-1})$			-0.0125 ***			
			(0.000)			
$\sigma^2(\pi^{e,\ professional}_{t-1})$				-0.0717 ***		
				(0.002)		
$\sigma^2(\pi^{e,\ household}_{t-1})$					-0.1250 ***	
					(0.004)	
$Gap(\pi^{e,\ professional}_{t-1})$						-0.4930 ***
						(0.013)
N	160,517	160,517	160,517	160,517	160,517	160,517
Lagged inflation rate	yes	yes	yes	yes	yes	yes
F/Wald chi_sq(3)	84.93	88.70	2315.13	1952.10	1118.83	1598.25
Prob>F/Prob>chi_sq	0.000	0.000	0.000	0.000	0.000	0.000

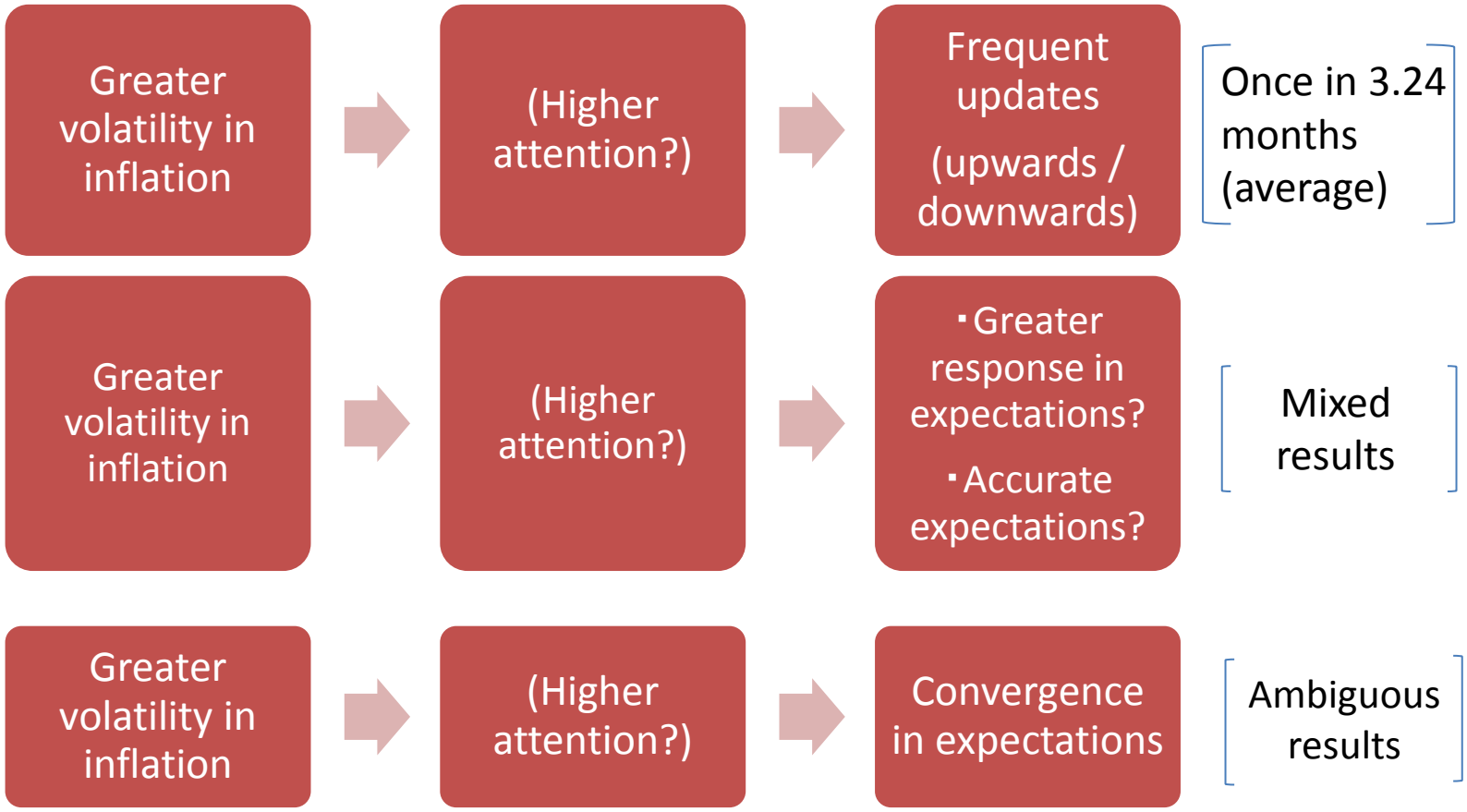
AFEs and household attentiveness (4)

- Hypothesis: Greater volatility in expectations under FIRE increases the extent of responses in expectations to the changes in expectations under FIRE
- Ambiguous estimation results

	(1)	(2)	(3)	(4)	(5)	(6)
Number of previous updates	-0.0298 ***					
	(0.006)					
Frequency of previous updates		0.0398				
		(0.045)				
$\sigma^2(\Pi_{t-1})$			0.0019 ***			
			(0.000)			
$\sigma^2(\Pi^{e,\ professional}_{t-1})$				0.0005		
				(0.001)		
$\sigma^2(\Pi^{e,\ household}_{t-1})$					0.2073 ***	
					(0.006)	
$Gap(\pi^{e,\ professional}_{t-1})$						0.4066 ***
						(0.020)
N	178,851	178,851	178,851	178,851	178,851	178,851
F/Wald chi_sq(3)	120.16	118.92	393.42	386.13	1486.3	817.12
Prob>F/Prob>chi_sq	0.000	0.000	0.000	0.000	0.000	0.000

AFEs and household attentiveness (5)

- Summarizing the results so far;



Estimation with alternative measures of inflation (1)

- Use of the CPI by income to derive AFEs (reflecting the variation in consumption basket)
- The results of the analysis by the direction of updates indicate (1) greater AFEs in response to volatile inflation, possibly in the updates in both directions, and (2) no convergence at least in case of upward updates.
- If households update their expectations upwards and downwards alternately, they would not likely to converge.

[Panel A: Explained = AFEs]

Direction of updates	Upwards			Downwards		
	(1)	(2)	(3)	(4)	(5)	(6)
$\sigma^2(\pi_{t-1})$	0.0246 ***			0.0143 ***		
	(0.000)			(0.000)		
$\sigma^2(\pi^{e,\ professional}_{t-1})$		0.1043 ***			0.0904 ***	
		(0.003)			(0.003)	
A_{jt-1} (frequency of previous updates)			0.8372 ***			-0.2729 ***
			(0.027)			(0.060)
N	117,312	117,312	114,531	82,727	82,727	82,727
Lagged inflation rate	yes	yes	yes	yes	yes	yes
F/Wald	17656.52	15934.01	3878.52	4980.56	4464.48	774.55
Prob>F/Prob>chi_sq	0.000	0.000	0.000	0.000	0.000	0.000

Estimation with alternative measures of inflation (2)

- Attention level is not linked to the AFEs (or FEs) in a general sense.
- What if I focus on the HHs whose attention level is expected to be higher than the others? – because of mortgage, or lower income per HH member… - may have higher attention level
- I thus pick up 1,758 HHs (out of 48,158 HHs) with mortgage, single worker, and more than 3 HH members. → re-estimate dynamic panel model only with these HHs

	CPI general		CPI by age		CPI by income		CPI by region	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
AFE_{jt-1}	-0.340 ***		-0.345 ***		-0.355 ***		-0.352 ***	
	(0.033)		(0.033)		(0.034)		(0.033)	
FE_{jt-1}		-0.269 ***		-0.280 ***		-0.263 ***		-0.271 ***
		(0.044)		(0.044)		(0.042)		(0.039)
FU_{jt-1}	0.511	-3.619 ***	0.658	-3.705 ***	0.354	-3.527 ***	0.629	-3.662 ***
	(0.788)	(1.066)	(0.740)	(1.074)	(0.817)	(0.859)	(0.773)	(0.949)
N	6,565	6,565	6,565	6,565	6,565	6,565	6,565	6,565
Hansen test of over-identification (p-value)	0.240	0.197	0.123	0.136	0.150	0.092	0.467	0.205
Test for first-order serial correlation (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Test for second-order serial correlation (p-value)	0.310	0.422	0.189	0.350	0.360	0.565	0.336	0.507

Discussion (1)

- Ad-hoc selection of the sample? Check the characteristics of their updating behaviors among all HHs.
- Estimation results of random-effects model indicate that the FEs of these households can be more responsive to the change in the attention level than the rest of the households (in a negative manner).

[Explained=forecast errors]

	(1)	(2)	(3)	(4)
Volatility measures (x)	$\sigma^2(\pi_{t-1})$	$\sigma^2(\pi^{e,\ professional}_{t-1})$	$\sigma^2(\pi^{e,\ household}_{t-1})$	$Gap(\pi^{e,\ professional}_{t-1})$
x	-0.02887 ***	0.0104 ***	-0.3990 ***	-3.157 ***
	(0.001)	(0.004)	(0.008)	(0.023)
x*(High attention dummy)	-0.00422 **	-0.0036	-0.0057	-0.0427
	(0.002)	(0.012)	(0.009)	(0.043)
N	383,439	383,439	383,439	383,439
Lagged inflation rate	yes	yes	yes	yes
Wald	25430.18	23168.24	22753.58	50167.08
Prob>chi_sq	0.000	0.000	0.000	0.000

Discussion (2)

- How to interpret the result? Some HHs that are likely to be sensitive to the inflation trend seem to be updating expectations upwardly, given higher attention level.
- They are receiving information, but update their expectations not necessarily in the direction of accuracy. This might be related to the information processing at each HH?
- Current theoretical model does not fit with the estimation results; alternative explanations needed.

[Sensitivity analysis to alternative volatility measures]

	CPI general		CPI by age		CPI by income		CPI by region	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
AFE_{jt-1}	-0.341 ***		-0.336 ***		-0.351 ***		-0.348 ***	
	(0.033)		(0.031)		(0.034)		(0.034)	
FE_{jt-1}		-0.266 ***		-0.272 ***		-0.258 ***		-0.277 ***
		(0.042)		(0.041)		(0.038)		(0.043)
FU_{jt-1}	0.686	-3.426 ***	0.435	-3.323 ***	0.459	-3.194 ***	0.687	-3.421 ***
	(0.746)	(1.021)	(0.684)	(0.956)	(0.766)	(0.845)	(0.761)	(1.031)
N	6,565	6,565	6,565	6,565	6,565	6,565	6,565	6,565
Hansen test of over-identification	0.259	0.164	0.154	0.052	0.327	0.022	0.393	0.227
Test for first-order serial correlation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Test for second-order serial correlation	0.287	0.450	0.248	0.394	0.174	0.594	0.358	0.450

Issues related to estimation methods

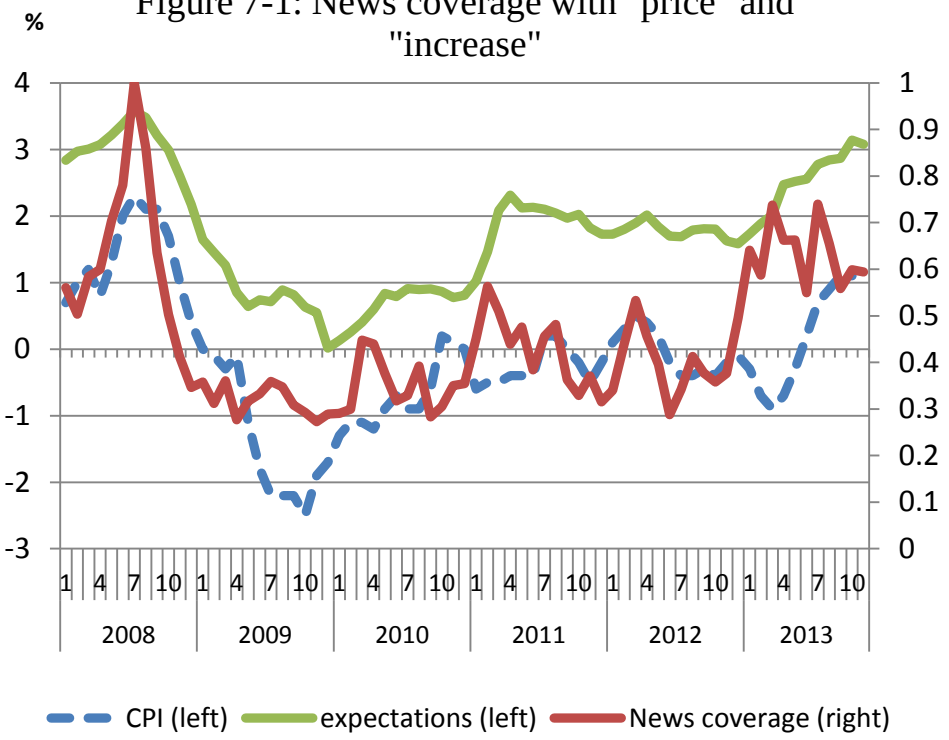
- **Dynamic panel estimation:** simple fixed-effects model might be sufficient? AR(1) but AR(2+) may be more appropriate.
- **Cross-section dependence**: correlation may exist among the error terms of HHs because of unobserved macroeconomic factors (which are correlated with included regressors). Further, the response level of individual expectations to macro-level shock information may well vary. → CCE approach (Pesaran, 2006)
- **Attrition bias**: substantial number of HHs drop after one-year survey period. Nonrandom attrition, but the estimation with inverse probability weight does not yield any substantial differences.
- **Missing variables & imputation:** how to deal with the missing observations only for a certain period.

Updating behavior focused on “News on inflation”

- Assuming that HHs update their expectations based on news information,

$$y_{it}^{*} = \alpha + \beta\pi_{t-1} + \gamma News_{t,t-1,t-2} + \delta X_i + u_{it}$$

Figure 7-1: News coverage with "price" and "increase"



Determinants of updating (marginal partial effects)

	(1)	(2)	(3)	(4)
Explained variable	Updating upwards		Updating downwards	
π_{t-1}	-0.0080 ***	-0.0185 ***	-0.0035 ***	-0.0035
	(0.001)	(0.001)	(0.001)	(0.001)
$NEWS_t$	0.0831 ***	0.0248 **	0.0087	
	(0.016)	(0.010)	(0.009)	
$NEWS_{t-1}$	-0.0281 *		0.1374 ***	0.1553
	(0.023)		(0.010)	(0.005)
$NEWS_{t-2}$	-0.1334 ***		0.0160 *	
	(0.018)		(0.009)	
N	200,334	205,351	200,334	205,351
Sociodemographic controls	yes	yes	yes	yes
Wald chi2>0	11664.52	11376.58	2461.7	2464.54
	0.000	0.000	0.000	0.000

Conclusions

- More volatile inflation rates trigger more updates both downwardly and upwardly.
- Mixed results wrt. the relationship b/w attention level and the level of forecast errors.
- Focusing on the households expected to have a motivation to have higher attention to the inflation (e.g. mortgage payment), these HHs tend to have higher expectations in face of volatile inflation without any convergence to more accurate expectations.
- On the other hand, the majority of HHs tend to update expectations in a staggered way, notwithstanding their attention levels.
- In general, the above results hold with forecast errors based on alternative price measures. They also pass sensitivity tests.