Beliefs about the Economy are Excessively Sensitive to Household-level Shocks:
Evidence from Linked Survey and Administrative Data

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Study how household-level events covary with macroeconomic forecasts by linking

- Danish registry $\rightarrow$ household-level events
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- forecasts are excessively sensitive to largely idiosyncratic events
- backcasts are also excessively sensitive
- overreaction in direction of affective valence of the events

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$\implies$ unifying explanation: affective association through memory

negative event is cue $\rightarrow$ recall negative events $\rightarrow$ pessimistic forecast

Outline

Part 1: Income changes and inflation forecasts
- Forecasts covary strongly & negatively with largely idiosyncratic household income changes
- Reject RE even allowing imperfect tracking

Part 2: Memory and affect play a role
- "Backcasts" covary more strongly & negatively with largely idiosyncratic income changes
- ER visits (uninformative negative events) lead to pessimistic inflation forecasts

Part 3: Synthesis
- Model of affective association
- Survey experiment: additional evidence for affective recall

Related Literature

1. Tests of limited information rational expectations (LIRE): Bordalo et al. (2020); Angeletos and Lian (2021); Broer and Kohlhas (2022)

   → We provide direct evidence for the role of household-level shocks

2. "Experience effects": Malmendier and Nagel (2011, 2016); Cavallo et al. (2017); Kuchler and Zafar (2019); D'Acunto et al. (2021); Cenzon (2023)

   → We have different domain, past and future events, mechanisms (recall and affect), formal tests of LIRE, richer data

3. Belief formation and overreaction in economic expectations, especially as tied to memory: Bénabou and Tirole (2002, 2004); Mullainathan (2002); Fuster et al. (2012); Schwartzstein (2014); Bordalo et al. (2018); Gabaix (2019, 2023); da Silveira et al. (2020); Zimmermann (2020); Gagnon-Bartsch et al. (2021); Huffman et al. (2022); Afrouzi et al. (2023); Sial et al. (2023); Bordalo et al. (2023); Enke et al. (2024); Bordalo et al. (2022); Salle et al. (2024); Graeber et al. (n.d.)

   → We empirically document the role of idiosyncratic, affective experiences

Data

Danish Consumer Expectations Survey and Key Questions

- Long-running monthly survey, available in high quality format from 2008:
    - Repeated cross-section with 1,500 participants monthly, response rate 64%
    - We use 2012-2019 for main analysis

- Linkable to registry data via CPR numbers

- Inflation forecasts (quantitative):

    By how many p.p. do you expect consumer prices to go up/down in the next 12 months?

- Inflation backcasts (quantitative):

    By how many p.p. have consumer prices gone up/down over the past 12 months?

- Forecasts of changes in hh financial situation (5-point Likert scale)

    How do you expect the financial position of your household to change over the next 12 mo's?
    [Will be a lot better; Will be a little better; Stay the same; Will be a little worse; Will be a lot worse]

Danish Registry: Key Variables

- Income and asset variables (annual, panel, from Danish Tax and Customs Authority)
    - Total income (from labor, business, transfers, properties, and other taxable income)
    - Labor income
    - Liquid assets
    - Total assets

- Age, Gender, No. of Children, Marital status, Education, from the Population and Education registers

- Emergency room visits from the Danish National Patient Registry (NPR)

Variables Construction   Sample Restrictions   Summary Statitstics: Demographics   Summary Statitstics: Survey

Empirical Tests

Detecting Excess Sensitivity of Inflation Forecasts

Plan for regressions: Recent Income Changes

Regress inflation forecast $\tilde{F}_i Y$ & realized inflation Y on household-level variable X_i

$$\tilde{F}_i Y = \tilde{\beta}_0^X + \tilde{\beta}_1^X X_i + \tilde{\varepsilon}_i^X \quad \text{v.s.} \quad Y = \beta_0^X + \beta_1^X X_i + \varepsilon_i^X$$

where

- $Y =$ realized inflation and $\tilde{F}_i Y =$ inflation forecast of hh i (12-month-ahead horizon)

- X_i is recent income changes log(nominal income) at $t-1$ minus log (nominal income) at $t-2$

- **Controls** [age, education, gender, no. of children, family type, average past income]

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Test of rational expectations (Bayesian updating $+$ no prior bias):

$$\text{If } X_i \text{ is in info set} \implies \tilde{\beta}_1^X = \beta_1^X$$

Intuition: under RE, forecast error $(:= Y - \tilde{F}_i Y)$ uncorrelated with all vars in info set

Remark: causal interpretation of regression is not required

Recent Income Changes and Inflation: Visualization

Univariate Regression Plot
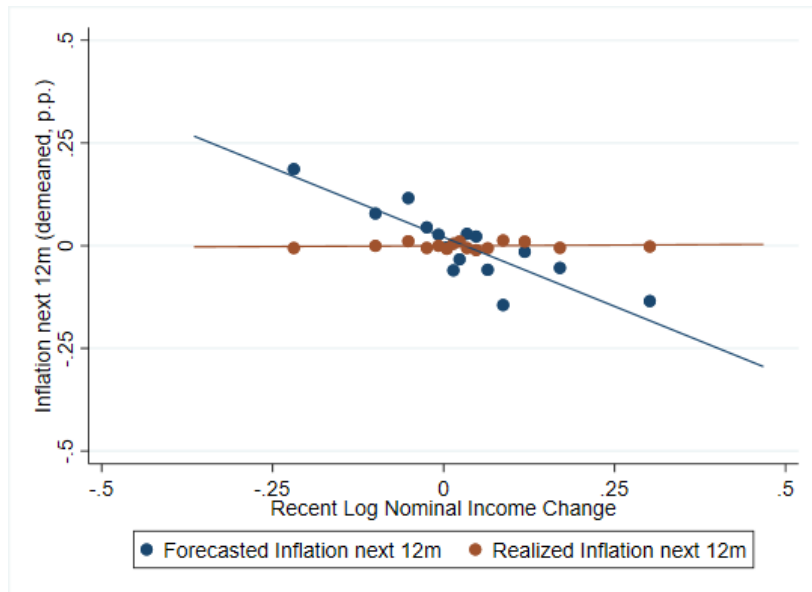
Recent Income Changes and Inflation: Regressions

	Realized Inflation next 12m		Forecasted Inflation next 12m		
	(1)	(2)	(3)	(4)	(5)
Recent Log Nominal Income Change	0.008 (0.022)	0.034** (0.016)	-0.655*** (0.139)	-0.674*** (0.139)	-0.563*** (0.136)
Demog. Controls	No	No	No	Yes	Yes
Month FE	No	No	No	No	Yes
Sample	Respondents 2012 - 2019	Population 1991 - 2019	Respondents 2012 - 2019	Respondents 2012 - 2019	Respondents 2012 - 2019
Observations	35050	62449159	35050	35050	35050

Notes: * for $p < 0.10$ ** for $p < 0.05$ *** for $p < 0.01$. Standard errors clustered two-way by month and respondent in parentheses.

- Magnitudes: 100% income growth $\Rightarrow$ -0.674 p.p. inflation forecasts Magnitude Benchmarks
- Mechanism: Excess-sensitivity is not explained by prior bias Placebo Income Changes

Additional results: Sub-sample Heterogeneity   Labor Income Changes   Wealth Changes

(In paper) Additional Robustness: additional years, real income changes

Relaxing Test Assumptions: X_i is not (fully) in information set

Examples:
- Household tracks real income, not nominal income
- Household only tracks wage income

$\implies$ Two solutions

Use Proxy Use survey-elicited measure of income change as new X_i, trivially in info set

Survey-Elicited Recent Income Changes

Bounding Under mild assumptions, can still construct tight bounds on coefficients

$$|\tilde{\beta}_1^X - \beta_1^X| < \frac{\sqrt{\text{Var}(Y)\,\text{Var}(X)}}{\text{Var}(X_i)} \approx 0.02$$

Intuition: hh income change is *very* idiosyncratic $\left(\frac{\text{Var}(X)}{\text{Var}(X_i)} \to 0\right)$ thus not informative of inflation

Bounding Assumptions

Future Income Changes and Inflation

Question: is co-movement of inflation forecasts and future income changes consistent with RE?

- Does news about *future* events affect forecasts like direct experiences?
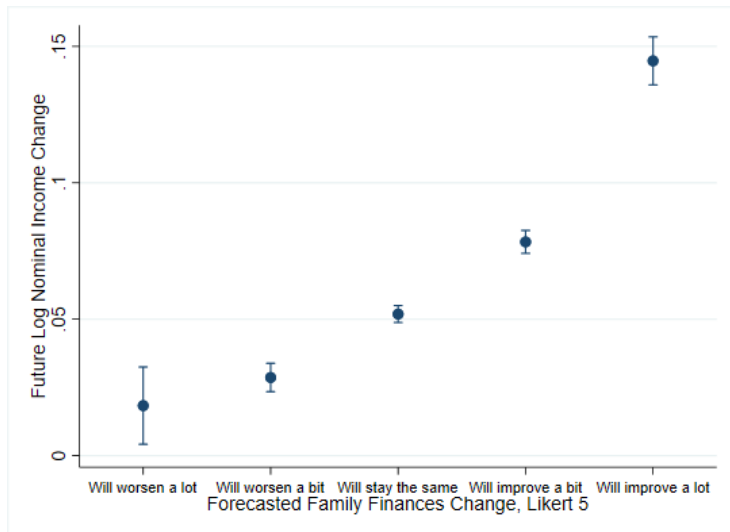
Two approaches:

- Forecasted survey-elicited future income changes

    Answer to Likert 5 question on future family financial situation in next 12mo's

- Realized future income changes

    $X_i =$log (nominal income) at $t + 1$ minus log (nominal income) at $t - 1$

Survey Proxy of Forecasted Income Changes is Very Informative

Survey Proxy of Future Income Changes: CDFs

Survey Proxy of Forecasted Income Changes and Inflation Forecasts

	Realized Inflation next 12m	Forecasted Inflation next 12m			
	(1)	(2)	(3)	(4)	(5)
Forecasted Family Finances Change	-0.009* (0.005)	-0.341*** (0.027)	-0.320*** (0.027)	-0.318*** (0.026)	-0.285*** (0.024)
Recent Log Nominal Income Change				-0.638*** (0.137)	
Demog. Controls	No	No	Yes	Yes	Yes
Month FE	No	No	No	No	Yes
Observations	35050	35050	35050	35050	35050

Notes: * for $p < 0.10$ ** for $p < 0.05$ *** for $p < 0.01$. Standard errors clustered two-way by month and respondent in parentheses.

- Results can be replicated in Michigan Survey of Consumer

Realized Future Income Changes and Inflation Forecasts

	Realized Inflation next 12m		Forecasted Inflation next 12m			
	(1)	(2)	(3)	(4)	(5)	(6)
Future Log Nominal Income Change	-0.027 (0.019)	0.062*** (0.018)	-0.405*** (0.105)	-0.358*** (0.103)	-0.445*** (0.106)	-0.268** (0.104)
Recent Log Nominal Income Change					-0.762*** (0.143)	
Demog. Controls	No	No	No	Yes	Yes	Yes
Month FE	No	No	No	No	No	Yes
Sample	Respondents 2012 - 2019	Population 1991 - 2019	Respondents 2012 - 2019	Respondents 2012 - 2019	Respondents 2012 - 2019	Respondents 2012 - 2019
Observations	35050	62449159	35050	35050	35050	35050

Notes: * for $p < 0.10$ ** for $p < 0.05$ *** for $p < 0.01$. Standard errors clustered two-way by month and respondent (and by person in column 2) in parentheses.

Rational Expectation bound $|\tilde{\beta}_1^X - \beta_1^X| < 0.04$

Visualization   Computing Test Bounds

Inflation Backcasts

The Role of Memory

Backcasts and Recent Income Changes

|	Realized Inflation past 12m		Backcasted Inflation past 12m		
	(1)	(2)	(3)	(4)	(5)
Recent Log Nominal Income Change	-0.011 (0.022)	0.039*** (0.015)	-0.858*** (0.208)	-0.862*** (0.200)	-0.725*** (0.187)
Demog. Controls	No	No	No	Yes	Yes
Month FE	No	No	No	No	Yes
Sample	Respondents 2013 - 2019	Population 1991 - 2019	Respondents 2013 - 2019	Respondents 2013 - 2019	Respondents 2013 - 2019
Observations	30752	62449159	30752	30752	30752

Notes: * for $p < 0.10$, ** for $p < 0.05$, *** for $p < 0.01$. Standard errors clustered two-way by month and respondent in parentheses.

Additional results: Forecasted Future Income Changes   Realized Future Income Changes

Excess Sensitivity: Forecasts vs Backcasts
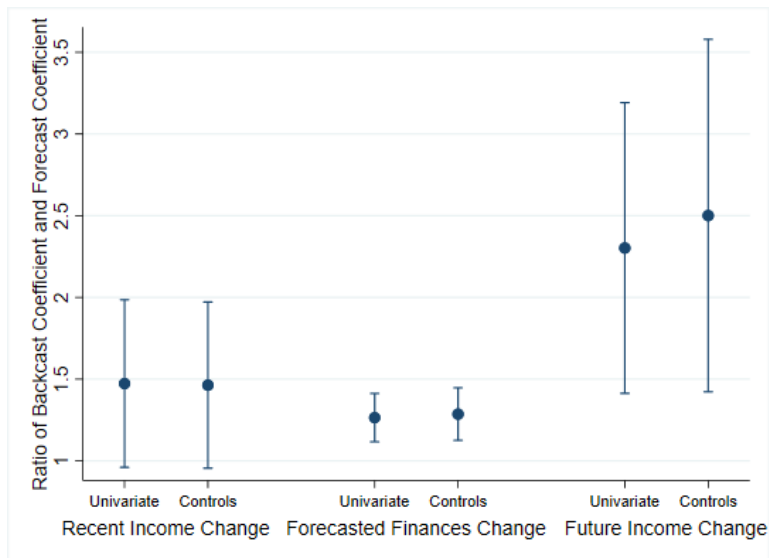
Emergency Room Visits

The Role of Affect

Affective Association

The Affective Association Hypothesis

- from affect heuristic in psychology [e.g., Finucane et al. (2000), Slovic et al. (2007)]
- Events generating negative affect $\implies$ pessimistic (higher inflation) forecasts & backcasts
- This works even across domains

Test: Is inflation forecast more pessimistic if randomly surveyed during month of ER visit?

$$\tilde{F}_i Y = \beta \times \mathbf{1}(\text{family member ER visit in survey month}) + \text{controls} + e_i$$

Affective Association: Health Shocks

	Inflation Forecasts and Backcasts		
	(1)	(2)	(3)
I(Fam. ER visit in survey month)	0.272*** (0.084)	0.210** (0.086)	0.210** (0.086)
# of ER visits		0.045*** (0.007)	0.048*** (0.019)
# of ER visits sq.			-0.001 (0.003)
Demog. controls	Yes	Yes	Yes
Month FE	Yes	Yes	Yes
Sample	2008-2018	2008-2018	2008-2018
Observations	91688	91688	91688

Notes: * for $p < 0.10$ ** for $p < 0.05$ *** for $p < 0.01$. Standard errors clustered two-way by month and respondent in parentheses. ER data covers years 2008-2018.

Remark: backcast coefficient larger than forecast

Not driven by pessimistic prior (control for total no. of ER visits) or selection into response

ER: Response Rate

Model of Affective Association Through Memory

A Unifying Explanation

Model Overview

Model setup

- Household forecasts future inflation Y cued by household event
- Memory is associative $+$ similarity is driven by affect

Recall mechanism:

- cue is positive $\rightarrow$ recall positive experiences (low inflation) $\rightarrow$ optimistic forecast
- cue is negative $\rightarrow$ recall negative experiences (high inflation) $\rightarrow$ pessimistic forecast

$\implies$ Main predictions:

- Over-reaction to signals with affective valence
- Irrelevant but affective signals induce biased inflation backcasts and forecasts

Additional Survey Experiment

Testing the Affective Recall Hypothesis

Own Survey Overview

Objective Can recalling an experience be made easier by a cue of similar affective valence?

Logistics
- 1523 US participants matching Census on age, gender, and ethnicity.
- Fielded on Prolific in October 2024
- (Soon) Denmark survey + admin data match

Survey Intuition
Question: What makes recall of experience with random affective valence easier
Answer: list of ten cues of separately randomized affective valence (Likert 3)

Implementation

Qa *"[...] What leads you to recall [negative/positive] experiences from the past?"*

Qb *"[...] What leads you to recall [high/low] inflation?"*

Cue Example: "*When I feel [anxious/calm and relaxed]* "

Survey Results

Key Results

1. What triggers recall of positive (negative) experiences? $\implies$ Positive (negative) cues

   Table Figure

2. What triggers recall of low (high) inflation? $\implies$ Positive (negative) cues

   Table Figure

Conclusion

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This paper:

- Inflation forecasts covary too strongly (& negatively) with hh income changes
- Inflation backcasts also covary too strongly
- Cross-domain affective events (ER shocks) also matter
- Mechanism: recall is biased by affective association $\implies$ forecast also biased

Future work: Does over-reaction manifest in actions?

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