Inflation Expectations and Spending: Evidence from an Experiment and Bank Transaction Data in Japan

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Disclaimer

- The data were made available through a strict contract between Mizuho Bank and Waseda University in the form of a consignment agreement, and were analyzed in a setting where measures were taken to prevent the identification of individuals, such as masking and other anonymous processing.

- Approved by the Ethics Review Committee on Research with Human Subjects of Waseda University (2023-440).

- Registered in the American Economic Association Registry (AEARCTR-0012631)

- The views and opinions expressed in this paper are solely those of the author and do not reflect those of Mizuho Bank.

Motivations

- Expectation management
  - Monetary policy. e.g. inflation target
  - Chronic low inflation in Japan

- We use bank transaction and survey data with the RCT of information provision
  - Effect on expectations
  - Effect on actual spending

Main Findings

- Information provision
    - shapes inflation expectations; however
    - does not translate into changes in actual spending.

Literature

- How inflation expectations influence behaviors
    - 2 challenges: endogeneity and reliance on self-reporting
    - Use of RCT, homescan, VAT
        - D'Acunto, Hoang, and Weber (2022), Coibion, Gorodnichenko, and Weber (2022), Galashin, Kanz, and Perez-Truglia (2022), Coibion et al. (2023, 2024), Schnorpfeil, Weber, and Hackethal (2023)
    - Comparison with Coibion, Gorodnichenko, and Weber (2022)
        - RCT and actual spending
        - Japan, not US; smaller scale; measurement of spending
- Inflation expectation formation
- Japan
    - Ueda (2010), Abe and Ueno (2016), Diamond, Watanabe and Watanabe (2020), Kikuchi and Nakazono (2023)
    - Ichiue and Nishiguchi (2015)

Contents

- Introduction (done)

- Data (RCT survey and transaction)

- Effects on expectations

- Effects on spending

RCT Survey

- February 2024
  - Mizuho bank sent 200,000 users an email
  - give an Amazon gift card worth 1,000 JPY to 500 respondents
  - selected from regular salary receivers
  - 2,626 responses (the response rate 1.31%), median time 8.6 mins
  - unique and valuable timing
- 19 questions
  - Mostly on expectations

4 steps

1. Provision of Information on Past Economic Outcomes
   - anchor their expectations at a common level
2. Elicitation of Prior Expectations
   - point estimate
   - inflation, spending, income, interest rate (deposit and mortgage)
3. Provision of Information on Inflation
   - next page
4. Elicitation of Posterior Expectations
   - probability estimate

- Provide one of three pieces of information
  1. "According to a survey of individuals, prices are expected to rise by about 10% in one year compared to now (as of December 2023, median expectation, Opinion Survey on the General Public's Views and Behavior)."
  2. "The Bank of Japan has set a price stability target of a 2% year-on-year increase in the consumer price index and has promised to achieve this as soon as possible."
  3. "The inflation rate over the past 10 years was about 0.5% (fiscal years 2010–2019, year-on-year increase in the consumer price index)."
- All true
- Randomly divided into groups with similar characteristics based on age, income, and gender

Prior inflation expectations

Q4 How much do you think "prices" will change in one year compared to now? "Prices" refer to the overall prices of the goods and services you purchase. (Note) Please answer as a percentage. Enter numbers in half-width characters only (do not include units such as % or "percent"). If prices decrease, please enter a negative value (example: -15).

Posterior inflation expectations

Q10 For the change in "prices" one year from now compared to now, how likely do you think each of the following cases is? Please answer with integers from 0 to 100, ensuring the total equals 100 percent. "Prices" refers to the overall prices of goods and services you purchase.[1]

- 50% or more increase
- Around 10% increase
- Around 5% increase
- Around 2% increase
- Around 1% increase
- Around 0% with little change
- Around 1% decrease
- Around 2% decrease
- Around 5% decrease
- Around 10% or more decrease

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[1]In this type of question, we provide the sum of all options to help respondents verify that the total adds up to 100 percent.

Transaction Data

- Record all transactions involving Mizuho Bank, including ATM withdrawals, payroll receipts, utility bill payments, and bank transfers, all of which are assigned identification codes and remarks in Japanese.

- Time frame from -12 to 19 weeks
  - with base week 0 (February 13).
  - from -3 to 4 months, with base month 0 starting from week 0

- Spending (nominal consumption) is proxied by total outflows
  - include cash withdrawals, credit card payments, interbank transfers, utility bill payments
  - exclude transactions related to saving and investment

Caveats

- Transactions through this bank only
  - Individuals may use other banks and security companies.

- Individuals, rather than households

- Measurement errors for consumption
  - outflows include many; no detailed information; delay (credit card); expenditure rather than consumption

Data Properties

- Exclude outliers
  - Prior exceed 100%; total of prob in posterior is not 100; always the first choice

- Representativeness
  - Survey respondents are concentrated around the age of 50

- Unbiasedness
  - no discernible differences among respondents across different groups

Effects of Information on Expectations

- Equation regressed:

$$\mathbb{E}_i^{post}[Y] - \mathbb{E}_i^{pre}[Y] = c + \beta D_i^T + \varepsilon_i, \tag{1}$$

  where D_i^T denotes the type of information provision that respondent i receives.

- Significant effect on inflation expectations

Dependent variable	(1)	(2)	(3)	(4)	(5)
	Expectation change (postrior − prior)				
	Inflation	Spending	Income	Interest rate	Mortgage rate
Intercept	-1.0015***	-1.7651**	0.7628**	-0.017	-8.8307**
	(0.352)	(0.854)	(0.386)	(0.046)	(3.972)
2% inflation treat	-1.6551***	-0.211	-0.347	-0.022	5.6161
	(0.494)	(1.199)	(0.541)	(0.065)	(5.578)
0.5% inflation treat	-1.0389**	0.917	-0.586	-0.1629**	4.6793
	(0.497)	(1.207)	(0.546)	(0.065)	(5.616)
Observations	2,594	2,594	2,581	2,594	2,594
R^2	0.0044	0.0004	0.0005	0.0028	0.0004

Inflation Expectations
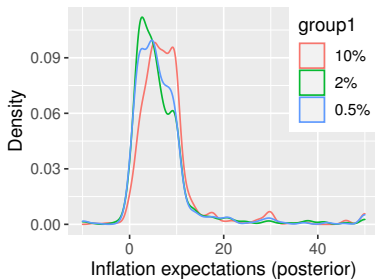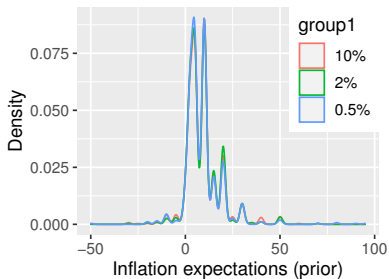
Analysis Based on Euler Equation

- Euler equation

$$C_t = \mathbb{E}[C_{t+1}] - \sigma(i_t - \mathbb{E}[\pi_{t+1}] - r_t^*),$$

$$\mathbb{E}[P_{t+1}C_{t+1}] - P_t C_t = (1-\sigma)\mathbb{E}[\pi_{t+1}] + \sigma(i_t - r_t^*),$$

$$
\begin{aligned}
\mathbb{E}_i^{post}[P_{t+1}C_{t+1}] - \mathbb{E}_i^{pre}[P_{t+1}C_{t+1}] = {} & c + \beta\left(\mathbb{E}_i^{post}[\pi_{t+1}] - \mathbb{E}_i^{pre}[\pi_{t+1}]\right) \\
& + \gamma\left(\mathbb{E}_i^{post}[Z_{t+1}] - \mathbb{E}_i^{pre}[Z_{t+1}]\right) + \varepsilon_i,
\end{aligned}
\tag{2}
$$

where β equals $1-\sigma$.

- $\beta = 1 - \sigma = 0.25$

	Dependent variable:		
	PC		
	(1)	(2)	(3)
π	0.249***	0.263***	0.723*
	(0.025)	(0.026)	(0.420)
w	0.270***		
	(0.023)		
i	0.329*		
	(0.191)		
mor	−0.101		
	(0.084)		
Constant	−0.510*	−0.350	0.537
	(0.263)	(0.268)	(0.856)
	OLS	OLS	IV
Observations	2,570	2,570	2,570
R^2	0.091	0.039	−0.081
First-stage F			5.44

IV: instrumented by treatment groups

Effects of Information on Spending

1. Difference-in-differences (DID) type equation:

$$Y_{it} = \beta D_{it}^T + \gamma Z_{it} + \alpha_i + \alpha_t + \varepsilon_{it}, \qquad (3)$$

where D_{it}^T denotes a dummy variable that equals one if respondent i receives treatment T (i.e., 10% or 2% inflation information) and month t is during or after the survey.

2. IV:

$$Y_{it} = \beta \mathbb{E}_i^{post}[\pi_{t+1}] + \delta \mathbb{E}_i^{prior}[\pi_{t+1}] + \gamma Z_{it} + \alpha_t + \varepsilon_{it}, \qquad (4)$$

where $\mathbb{E}_i^{post}[\pi_{t+1}]$ is instrumented using the treatment of 2% or 0.5% inflation provision.

3. Dynamics:

$$Y_{it+h} - Y_{it-1} = \beta_h D_i^T + \gamma(Z_{it+h} - Z_{it-1}) + \varepsilon_{it+h} \qquad (5)$$

or

$$Y_{it+h} - Y_{it-1} = \beta_h \left(\mathbb{E}_i^{post}[\pi_{t+1}] - \mathbb{E}_i^{pre}[\pi_{t+1}] \right) + \gamma(Z_{it+h} - Z_{it-1}) + \varepsilon_{it+h}, \qquad (6)$$

which is estimated for each h.

Insignificant effect on spending

	(1)	(2)	(3)	(4)	(5)
			Dependent variable		
	Outflows	Outflows inc. saving	Cash withdrawals	Outflows	Outflows
10% inflation T after provision	-4,191	13,702	4,563	-3,137	
	(43,310)	(44,942)	(6,426)	(43,247)	
2% inflation T after provision	14105.900	10725.673	3826.140	12832.924	
	(36,614)	(37,771)	(6,496)	(36,738)	
Post inflation expectations					-4,965
					(11,928)
Prior inflation expectations					247.7
					(20,752)
Inflows	0.4609***	0.4783***	0.001	0.4605***	0.4719***
	(0.024)	(0.018)	(0.001)	(0.024)	(0.023)
Log wealth	63351.9999***	65013.2656***	6056.3563**		18783.6853***
	(12,190)	(12,527)	(3,034)		(4,273)
Log annual income	4406.298	6207.876	-38.308		10030.5264***
	(6,306)	(6,322)	(446)		(2,521)
Fixed effects		Individual, month			month
Observations	20,752	20,752	20,752	20,752	20,752
R^2	0.77	0.78	0.41	0.77	0.73
First-stage F					13.12

Insignificant Changes in Spending
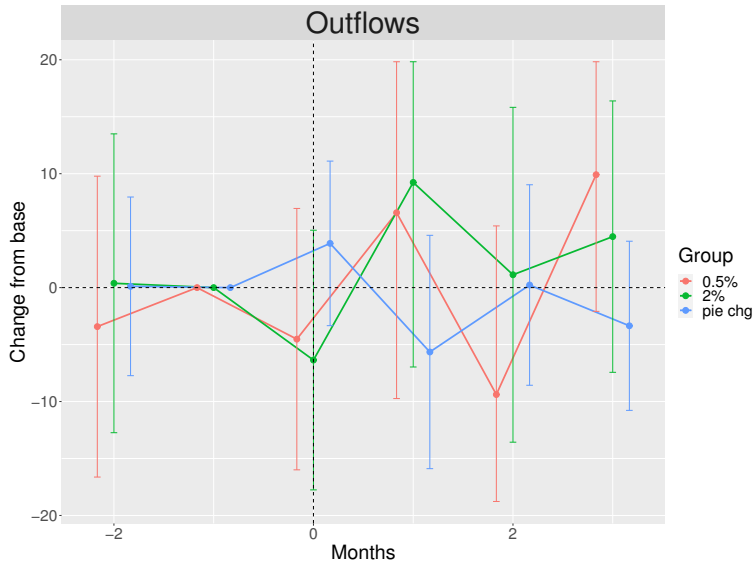
Note: Bars indicate 95% confidence intervals.

Further Results

- Weekly basis

- Rate changes in spending
  - $(Y_{it+h} - Y_{it-1})/$(time mean of Y_{it})

- Heterogeneity
  - age, education, wealth, liquidity constraint, etc.
  - Respondents with higher wealth and exposed to higher inflation information (i.e., 10%) show a tendency towards a significantly positive change in spending.

- To conclude, our findings highlight the challenge of managing inflation expectations.