How do inflation expectations respond to idiosyncratic shocks? Evidence from COVID-19*

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Abstract

Using a household survey, this study examines how households respond to idiosyncratic shocks in forming their inflation expectations. We find income shocks raise inflation expectations. We also find that updating information sets of households offsets an increase in inflation expectations caused by a positive income shock. The evidence supports the view of money illusion a la Lucas (1973).

JEL Classification: D83; D84; E31
Keywords: Inflation expectations; Covid-19; Idiosyncratic shocks

1 Introduction

This study aims to answer how households form inflation expectations. We focus on how inflation expectations respond to idiosyncratic shocks from COVID-19. To this end, we use an online survey of households every quarter to collect their shorter- and longer-term forecasts on inflation rates and how they face idiosyncratic shocks due to COVID-19. We combine the survey on inflation expectations with the survey on COVID-19 shocks and examine how households respond to not aggregate shocks but idiosyncratic shocks which should not influence expectations of aggregate inflation rates.

There are two findings. First, idiosyncratic shocks significantly influence not only shorter- but also longer-term forecasts. A negative income shock significantly increases inflation expectations by 0.25%–0.5% while a negative income also does over the medium- and longer-term forecasts on inflation rates. The responses to idiosyncratic income shocks are similar among shorter- and longer-term forecasts on inflation. Second, the frequency of updating information about inflation rates matters as determinants of inflation expectations. In fact, the frequent updating manner increases inflation outlook while it offsets an increase in inflation expectations due to positive and negative income shocks. Furthermore, we find asymmetric responses of inflation expectations. An increase in inflation expectations due to a positive income shock is counteracted by the frequent revisions of information sets. However, it is not the case when inflation expectations increase due to a negative income shock. The evidence that higher inflation expectations

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are induced by a positive income shock and offsetted by attention to new information about inflation rates may imply that the money illusion predicts the households' expectation formation of inflation.

Our study is related to two strands of the literature. First, our study is related to those exploring the determinants of households' inflation expectations. A large body of the literature reports that socioeconomic factors (Cavallo et al., 2017; Coibion et al., 2018a; Diamond et al., 2018; Easaw et al., 2013) as well as respondents' financial situation, purchasing attitude, and macroeconomic perspectives and shocks, and to news on inflation (Ehrmann et al., 2017; Pfajfar and Santoro, 2013; Baker et al., 2020; Binder, 2020).[1] Our findings contribute to the existing literature by documenting that idiosyncratic shocks determine households' inflation expectations. Second, our approach is related to previous studies indicating that economic agents do not always update their information sets. While standard economic theories assume full-information rational expectations (FIRE), Mankiw and Reis (2002) and Carroll (2003) maintain the *sticky* information hypothesis that information disseminates slowly.[2] By directly asking respondents how often they collect price information, our unique survey data allows us to investigate whether the information-updating manner influences inflation expectations.

2 Survey and inflation expectations

This section summarizes the survey data on household's inflation expectations and shows basic statistics. We conduct a quarterly online survey of Japanese households from 2015Q4 to collect inflation expectations over the short- and long-terms. Respondents are asked the following questions:

(1) Frequency of updating information on inflation rates.
   (a) "How often do you collect information on the overall levels of prices?"
   (b) "How often do you collect information on the prices of goods and services you frequently purchase?"

(2) Outlook of price levels over shorter- and longer-horizons.
   - "What do you think will be the levels of CPI over the next one-, three-, and ten-year horizons, given that the current level of CPI is 10,000? Provide price-level figures over each horizon, excluding the impact of consumption tax hike on the price levels."

Regarding Questions (1)-(a) and (1)-(b), respondents choose the most appropriate one from the following choices: (1) Almost every day, (2) Four or five times a week, (3) Twice or thrice a week, (4) Once a week, (5) One or more times a week, (6) Twice or thrice a month, (7) Once a month, (8) Once every two to three months, (9) Once in six months, (10) Once a year, (11) Less than once a year, and (12) Do not collect. These questions can directly reveal the manner of households' information collection. Our focus is on how they update their information sets; we also aim to determine whether there exist any differences in the frequency of updating their information sets among the aggregate price levels and prices of daily commodity.

[1] Coibion et al. (2018a) provide a comprehensive survey about the formation of inflation expectations.

[2] Dupor et al. (2010) develop a model that integrates sticky prices and information and show that both rigidities are present in the U.S. data. Coibion and Gorodnichenko (2012) and Andrade and Le Bihan (2013) find information rigidities even among the board of governors of the Federal Reserve as well as professional forecasters. Patton and Timmermann (2010), Capistrán and Timmermann (2009), Andrade et al. (2016), and Falck et al. (2019) also examine disagreement in inflation expectations. Hori and Kawagoe (2013) and Kikuchi and Nakazono (2020) examine whether the *sticky* information hypothesis is supported for Japanese households.

Question (2) asks respondents to report their forecasts numerically for the next 1-, 3-, and 10 years, on an average. This question can directly measure households' inflation expectations over both the shorter- and longer horizons.

3 How do inflation expectations respond to idiosyncratic shocks?

In order to examine how inflation expectations respond to idiosyncratic shocks, we estimate the following equation;

$$E_t^i[\pi_{t\to t+k}] = \alpha_0 D^{Update} + \alpha_1 D^{NegativeIncome} + \alpha_2 D^{PositiveIncome} + \mathbf{X}\gamma + \varepsilon_t^i, \qquad (1)$$

where $E_t^i[\pi_{t\to t+k}]$ is denoted as inflation forecasts by individual i over the next k quarters at time t. For example, when $k = 12$, $E_t[\pi_{t\to t+12}]$ is the inflation forecast over the next 12 quarters (*i.e.* over the next 3 years) at time t. D^{Update} is denoted as a dummy variable when households update their information sets about infration rates at least once a quarter. $D^{NegativeIncome}$ and $D^{PositiveIncome}$ are denoted as dummy variables when households face a negative and positive income shock, respectively.[3] The control variables ($\mathbf{X}$) include constant term, time dummies, prefecture dummies, a gender dummy, age, a income dummy, and educational attainments.

The first to third columns in Table 1 summarize the estimation results of Equation (1). First, frequently updating information sets about inflation rates increases inflation expectations. The coefficient α_0 for D^{Update} is significantly positive in all cases from specifications (1) to (3); the impact ranges from 0.1 to 0.3. The result suggests that the updating manner of information sets about inflation rates predicts the level of inflation expectations. Second, the table shows that idiosyncratic shocks increase inflation expectations. The coefficient α_1 for $D^{NegativeIncome}$ is significantly positive in all cases from specifications (1) to (3); the impact ranges from 0.3 to 0.5. This is generally the case when households face a positive income shock. The coefficient α_2 for $D^{PositiveIncome}$ is positive in all cases from specifications (1) to (3); the impact ranges from 0.2 to 0.4. The results suggest that not only a negative but also a positive income shocks induce households to form higher inflation expectations. They support the view that not macroeconomic shocks but idiosyncratic ones influence households' inflation expectations.

We further examine whether idiosyncratic shocks influence inflation expectations even when households are attentive to news about inflation rates. To this end, we estimate the following equation:

$$\begin{aligned} E_t^i[\pi_{t\to t+k}] =& \alpha_0 D^{Update} + \alpha_1 D^{NegativeIncome} + \beta_1 D^{Update} \times D^{NegativeIncome} \\ &+ \alpha_2 D^{PositiveIncome} + \beta_2 D^{Update} \times D^{PositiveIncome} + \mathbf{X}\gamma + \varepsilon_t^i, \end{aligned} \qquad (2)$$

Equation (2) contains cross term between idiosyncratic income shocks and D^{Update}. When the coefficients β_1 and β_2 for the cross terms are positive, the frequent revisions of information sets about inflation rates lead to higher inflation expectations. However, when the coefficients are negative, updating information sets offsets a rise in inflation expectations due to idiosyncratic income shocks.

[3] Intage Inc. surveys the effects of COVID-19 on daily life of its online monitors from 23 October, 2020 to 4 November, 2020. It asks respondents to answer the following questions; "How have you been affected by the spread of COVID-19 since April? Please indicate the situation for yourself for each period: (A) April–May (after the declaration of the state of emergency and before the lifting of the declaration of it), (B) June (period of relaxation of self-restraint), (C) July–August (period of re-spreading of infection), and (D) September–Latest (easing of travel, easing of business at restaurants)." The questions are about whether income decreased or increased during the periods. We connect the survey on inflation expectations with the survey about income shocks and construct dummy variables: $D^{PositiveIncome}$ and $D^{NegativeIncome}$.

The fourth to sixth columns in Table 1 summarize the estimation results of Equation (2). The table shows the offsetting effects of D^{Update} on higher inflation expectations due to idiosyncratic income shocks. First, the coefficient β_1 for the cross term between $D^{NegativeIncome}$ and D^{Update} is negative in all cases from specifications (4) to (6); the impact ranges from -0.1 to -0.5. The result suggests that attentive households to information about inflation rates harness inflation expectations when they face a negative income shock. Second, the coefficient β_2 for the cross term between $D^{PositiveIncome}$ and D^{Update} is negative in all cases from specifications (4) to (6); the impact is larger than in α_1. In fact, α_2 ranges from -0.6 to -0.8. The result suggests the offsetting effects of D^{Update} on higher inflation expectations due to a positive income shock when households are attentive to information about inflation rates. Actually, the summation of α_2 and β_2 is almost zero in specifications (4) to (6).

4 Conclusion

This study aims to answer how households form inflation expectations. We focus on how inflation expectations respond to idiosyncratic shocks from COVID-19. To this end, we use an online survey of households every quarter to collect their shorter- and longer-term forecasts on inflation rates and how they face idiosyncratic shocks due to COVID-19. We combine the survey on inflation expectations with the survey on COVID-19 shocks and examine how households respond to not aggregate shocks but idiosyncratic shocks which should not influence expectations of aggregate inflation rates.

There are two findings. First, idiosyncratic shocks significantly influence not only shorter- but also longer-term forecasts. A negative income shock significantly increases inflation expectations by 0.25%–0.5% while a negative income also does over the medium- and longer-term forecasts on inflation rates. The responses to idiosyncratic income shocks are similar among shorter- and longer-term forecasts on inflation. Second, the frequency of updating information about inflation rates matters as determinants of inflation expectations. In fact, the frequent updating manner increases inflation outlook while it offsets an increase in inflation expectations due to positive and negative income shocks. Furthermore, we find asymmetric responses of inflation expectations. An increase in inflation expectations due to a positive income shock is counteracted by the frequent revisions of information sets. However, it is not the case when inflation expectations increase due to a negative income shock.

The evidence that higher inflation expectations are induced by a positive income shock and offsetted by attention to new information about inflation rates may be interpreted as the money illusion *a la* Fisher (1928). An idiosyncratic positive income shock may be misinterpreted as an inflationary shock for inattentive households. However, if households are attentive to news about inflation rates, they interpret a positive income shock only for themselves as an idiosyncratic shock. In this case, inflation expectations should be independent of an idiosyncratic income shock for attentive households. Our findings may imply that the money illusion predicts the households' expectation formation of inflation.

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Table 1: How do inflation expectations respond to idiosyncratic shocks?

Specification (1)–(3): $E_t^i[\pi_{t\to t+k}] = \alpha_0 D^{Update} + \alpha_1 D^{NegativeIncome} + \alpha_2 D^{PositiveIncome} + \mathbf{X}\gamma + \varepsilon_t^i$

Specification (4)–(6): $E_t^i[\pi_{t\to t+k}] = \alpha_0 D^{Update} + \alpha_1 D^{NegativeIncome} + \beta_1 D^{Update} \times D^{NegativeIncome} + \alpha_2 D^{PositiveIncome} + \beta_2 D^{Update} \times D^{PositiveIncome} + \mathbf{X}\gamma + \varepsilon_t^i$

	(1)	(2)	(3)	(4)	(5)	(6)
	1 year	3 year	10 year	1 year	3 year	10 year
	$k=4$	$k=12$	$k=40$	$k=4$	$k=12$	$k=40$
α_0: D^{Update}	0.280***	0.168***	0.0725**	0.349***	0.208***	0.0952***
	(0.0562)	(0.0422)	(0.0312)	(0.0588)	(0.0438)	(0.0328)
α_1: $D^{NegativeIncome}$	0.469***	0.501***	0.250***	0.813***	0.673***	0.321***
	(0.0910)	(0.0698)	(0.0496)	(0.167)	(0.126)	(0.0911)
β_1: $D^{Update} \times D^{NegativeIncome}$				−0.510***	−0.258*	−0.107
				(0.198)	(0.150)	(0.108)
α_2: $D^{PositiveIncome}$	0.250	0.357**	0.187*	0.699**	0.855***	0.563***
	(0.200)	(0.158)	(0.111)	(0.349)	(0.301)	(0.218)
β_2: $D^{Update} \times D^{PositiveIncome}$				−0.734*	−0.812**	−0.613**
				(0.422)	(0.348)	(0.246)
Constant	3.740***	3.482***	2.514***	3.689***	3.460***	2.502***
	(−0.293)	(−0.229)	(−0.164)	(0.293)	(0.230)	(0.164)
Control variables	YES	YES	YES	YES	YES	YES
Time Fixed Effect	YES	YES	YES	YES	YES	YES
Prefecture Dummy	YES	YES	YES	YES	YES	YES
Observations	27,980	28,775	29,048	27,980	28,775	29,048

Note: The forecasts of inflation above 25 and below −5 percent are trimmed. Standard errors in parentheses are clustered at individual levels, and *, **, *** indicate 10%, 5%, and 1% significance. Time dummy and constant term are included as the control variables.