

Inflation Literacy and Inflation Expectations

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Preliminary Version

Abstract

Economic agents' understanding of the inflation process and of the goals and intentions of the central bank is an important prerequisite for the effectiveness of monetary policy. Using micro data from a survey conducted among 2,000 Austrian households, we construct a summary indicator of "inflation literacy" from 10 questions which measure the knowledge about inflation of households. We find that this indicator significantly affects both the level and the uncertainty of inflation expectations: Households with relatively higher levels of inflation literacy tend to have lower and thus more realistic short-term and long-term inflation expectations. Also ex-post, we find that deviations of individual inflation expectations from the actual outcome are lower for consumers with higher levels of inflation literacy. Concerning the effect on the uncertainty of inflation expectations, our results suggest that, interestingly, people with higher levels of inflation literacy are less certain about their inflation expectations than people with less inflation literacy.

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1. Introduction

In standard micro-founded macro models, it is assumed that economic agents are rational and inflation expectations are good predictors of future inflation. As a corollary to the rationality assumption, it is assumed that all economic agents have the same expectations. Inflation expectations are all but homogenous. When looking at inflation expectations of individuals, whether they are professional forecasters or households, most studies find consistently that there is always some degree of heterogeneity. Remarkably, such differences among survey respondents are found not only for expectations of future inflation but even for perceptions of current inflation (Fritzer and Rumler, 2015).

Furthermore, it has been repeatedly observed that certain demographic groups are systematically and significantly more accurate, both in predicting inflation and in knowing the level of current inflation.¹ At the same time, uncertainty of individual respondents is also smaller among the same demographic groups. Despite the regularity of these findings, most studies that use sociodemographic indicators to explain heterogeneity in inflation expectations do not find a one-to-one relationship between education or income and the accuracy of inflation expectations (or perceived inflation) of households. A few studies test whether specific knowledge about economic and financial processes affects the formation of inflation expectations. They find that higher specific financial and/or economic literacy – rather than general educational attainment – is able to explain why inflation expectations are more accurate for certain groups of respondents.

A strand of literature has designed surveys or experiments to gauge the respondents' level of financial and economic literacy (which includes numeracy) and have then asked them to report their expected and perceived level of inflation (e.g. Bruine de Bruin et al., 2010, Burke and Manz, 2014). The generally accepted definition of financial literacy is: “the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being“.² In these studies it is assumed that “understanding inflation” is just one of three elements of the definition of financial literacy.³ Those studies that go beyond financial literacy such as Burke and Manz (2014) take into account economic literacy and numeracy. Economic literacy in this case includes more detailed questions on inflation as well as detailed questions on monetary policy and the central bank.⁴

With the exception of the last paper, understanding central bank communication, policy and goals has not been included in the definition of financial and economic literacy. Also, these papers do not investigate how well people understand the concept of inflation, its causes and consequences. For a central bank, however, this is crucial to manage inflation expectations and there is little information about the knowledge of consumers about inflation. Thus, the survey we use in this paper, aims at measuring respondents' understanding of inflation: how inflation is measured, where and how respondents get information about inflation, why

¹ Bryan and Venkatu (2001a) and (2001b), Pfajfar and Santoro (2008).

² Hung et al. (2009).

³ The other two are interest compounding and risk diversification; see Lusardi (2008).

⁴ Economic literacy is a much broader concept which includes concepts such as opportunity costs, marginal returns, comparative advantage, etc.

inflation is bad, what is the definition of price stability of the ECB, etc. Thus, the indicator that we use does not measure financial literacy, but rather the knowledge or understanding of inflation. This “inflation literacy” indicator is more relevant from the point of view of a central bank that needs to know whether people understand its goals and intentions.

In this paper we use micro-data from a survey to identify inflation literate respondents, and to investigate whether higher inflation literacy translates into better inflation forecasts by households and what higher inflation literacy means in terms of individual uncertainty of inflation expectations. Our hypothesis is that the heterogeneity found in surveys of inflation expectations can be at least partly explained by different degrees of understanding inflation, and that this knowledge has an influence on the accuracy of predicting inflation and on the uncertainty of inflation expectations.

We find that households with relatively higher levels of inflation literacy, measured by the indicator constructed from survey responses, tend to have lower and thus more realistic short-term and long-term inflation expectations. Also ex-post, we find that deviations of individual inflation expectations from the actual outcome are lower for consumers with higher levels of inflation literacy. Concerning the effect on the uncertainty of inflation expectations, our results suggest that, interestingly, people with higher levels of inflation literacy are less certain about their inflation expectations than people with less inflation literacy. This suggests that a better knowledge of economic and financial matters obviously makes people more (and not less) careful in their assessment of future macroeconomic developments.

The remainder of the paper is structured as follows. In the next section we summarize the related literature and discuss how our contribution extends the existing literature. In section 3 we describe our empirical approach which is based on a micro dataset obtained from a survey among 2,000 Austrian households. Section 4 presents and discusses the empirical results and section 5 draws some conclusions.

2. Does knowledge about inflation matter for understanding and predicting inflation?

For the central bank, investigating inflation expectations is important for a number of reasons. First, inflation expectations are important for present and future inflation; second, from the level and changes of inflation expectations one can determine whether they are anchored to the central bank target. Unanchored inflation expectations, can be due not only to a lack of credibility of the central bank but also to a lack of understanding the process of controlling inflation by the central bank. If economic agents understand what drives inflation and why and how the central bank controls inflation they will predict inflation more accurately. Knowing what is important for people in forming inflation expectations is crucial for central banks to better articulate their communication.

While there exists much research on understanding which sociodemographic characteristics and which level of financial literacy explains differences in inflation expectations and forecast errors, very little is known about whether households understand inflation, where they obtain

information on inflation necessary to form expectations and even whether they are interested in inflation.

One of the few studies that tackle this question is the one by Carvalho and Nechio (2014). In their paper, they use the Michigan Survey to indirectly analyze whether households understand monetary policy. For this, they combine the responses of households about inflation, interest rates and unemployment to test whether the answers given were consistent with basic principles implicit in the Taylor rule. Their hypothesis is that if consumers understand monetary policy, their answers would be consistent with the principles of the Taylor rule. They find that only a small fraction of households respond with a Taylor rule in mind when asked about inflation and interest rates. As in most other studies, respondents that answer “as if they understood monetary policy” are more educated and have a higher income. However, this paper does not explore the effects that understanding monetary policy may have for the formation of more realistic inflation expectations.

Burke and Manz (2014) look at the effect of economic literacy on inflation forecast accuracy of consumers. The interesting part of their experiment is that they are able to disentangle two channels which can influence forecast accuracy: the choice of information and the use of this information. They find that individuals with higher economic literacy are not only better at choosing the relevant information but also at using it in updating their forecasts. Furthermore, they find that once economic literacy is accounted for, the effect of demographic factors in explaining differences in inflation expectations becomes less significant. Finally, and which is perhaps more related to our own study, is the distinction in their indicator between monetary policy literacy⁵, financial literacy and numeracy. They find that the first two indicators contribute independently to forecasting performance, while numeracy does not seem to be related to forecast accuracy. They conclude that forecast accuracy would increase if households understood the concept of inflation and knew which information is more relevant. From their experiment it is clear, that the level of economic literacy is low for the average consumer and that even in a laboratory experiment, people are not good at choosing and processing information and as a result do not forecast inflation accurately. Although very well designed, the experiment is by its nature biased because people are forced to focus on forecasting inflation even if it is not relevant for their personal lives.

Van der Cruijssen et al. (2015) design a survey with 11 questions to directly ask individuals in the Netherlands how much they know about monetary policy and analyse whether understanding monetary policy matters for forming realistic inflation expectations. In this sense, their approach is similar to ours, but they concentrate more on the knowledge about the ECB as an institution and less on whether people understand inflation or where to get relevant information. They find that the level of knowledge is rather low: on average, the number of correct answers was below 5 (out of 11). As in previous studies, they find that individuals with higher education and higher income tend to have more knowledge about monetary policy. A more unsettling result is that about a quarter of the respondents are not interested in monetary policy, as they do not see how it would affect their personal lives. Even among those that believe to be well informed, their understanding of the ECB’s objective is not fully

⁵ Their questions on monetary policy literacy are similar to our questions.

correct. The good news is that those with a better knowledge of monetary policy have both more realistic and more accurate inflation expectations.

Our paper addresses similar questions to the ones posed by these papers but extends their analysis by specifically testing the role of inflation literacy for inflation expectations and uncertainty. The advantage of our approach is that we use micro data and thus we can directly relate the respondents' knowledge about inflation to their expectations, expectation errors and uncertainty of their own forecasts. In order to do this, we construct an "inflation literacy" indicator based on the survey which we then use to explain the differences among respondents with respect to the level of expected inflation, the ex-post accuracy of their predictions and the uncertainty with which the respondents assess their own forecasts.

3. Data and Methodology

3.1. Data

In our empirical analysis we use data obtained from a survey which was conducted by IFES on behalf of the OeNB from May to July 2013. In this survey, 2,000 Austrian households were asked about 30 questions on inflation perceptions, inflation expectations and general aspects of inflation in Austria (see IFES, 2013). The respondents were chosen according to a stratified multistage clustered random sampling strategy to ensure representativeness – with respect to a number of socioeconomic characteristics – of the general Austrian population.

In the survey, respondents had to provide quantitative estimates of expected price developments over the next 12 months and the next 5 to 10 years in interval ranges, i.e. short-term and long-term inflation expectations are available as intervals. Along with their short- and long-term inflation expectations, people were also asked about the probability or likeliness they attach to their forecast on a scale from 10% probability (very uncertain) moving up in 10%-steps to 100% probability (totally certain). The resulting variable is a direct measure of the subjective or perceived uncertainty of the individual's own inflation expectations.

In addition, the survey contains general questions about whether inflation is important for people's lives, which inflation indicators they know, why inflation is detrimental and what is their main source of information about inflation developments. There are also questions more related to monetary policy, such as people's assessment of the optimal rate of inflation and whether they know the price stability goal of the ECB. The survey additionally contains information on a range of socioeconomic characteristics of the respondents, including education, income, age, gender, household size, etc.⁶

⁶ For more information on the questionnaire, the sampling and descriptive results of the survey, see Fluch et al. (2013), as well as Fritzer and Rumler (2015).

3.2. An indicator of inflation literacy

In order to assess whether people's understanding of inflation and of the intentions of the central bank affects the formation of inflation expectations, we use data from the survey to construct a summary indicator of "inflation literacy". Thanks to the richness of the survey, the indicator also contains elements of monetary policy and financial literacy, as shown below.

Specifically, the indicator summarizes the information from ten survey responses into a score variable ranging from a minimum of 0 to a maximum of 10: The first question which is included in our summary indicator asks how many different inflation indicators (out of a list of six)⁷ people know and how well they are informed about each of them⁸ (second question). The third and fourth contribution to the summary indicator are derived from people's responses about their knowledge of the inflation rate in the month when the survey was conducted and in the last full year before the survey (2012): Values of 1 are assigned if people are able to name the correct interval (2-3% in both cases) and 0 otherwise. The next component of the summary indicator is derived from a question about people's perceptions of fuel price developments in the six months preceding the survey. A value of 1 is assigned if the correct answer ("fuel prices have decreased slightly/remained broadly constant over the last six months") was picked. The sixth question we consider is about the level of yearly inflation rates respondents find acceptable (a value of 1 is assigned if the responses are between 1% and 3% and 0 otherwise). From another question about the negative effects of deflation, we construct a dummy indicating those respondents who consider deflation to be more harmful than inflation. The next question tests whether people know the exact definition of price stability as adopted by the Eurosystem ("inflation below but close to 2% in the medium term"). The ninth contribution to the summary indicator comes from the question about the main source of people's knowledge about inflation. A value of 1 is assigned if the main sources are institutions such as the OeNB, the ECB, Statistik Austria, Eurostat, etc. as opposed to mass media or just personal observation. The last question entering our summary indicator is related to the concept of real versus nominal variables asking about sensible investment strategies in case of negative real interest rates.⁹

The simple sum of these ten components constitutes our summary indicator which – thanks to the first component – is a quasi-continuous variable ranging from 0 to 10. Higher values indicate that respondents have a relatively better knowledge about inflation, inflation indicators, monetary policy and real versus nominal concepts. Figure 1 shows the distribution of the inflation literacy indicator across all respondents. The indicator has 55 unique values and the bins summarize the frequencies of scores between two integers including the lower integer. The mean score of all respondents is 3.18 (median 3.17) and the standard deviation is 2.13. These numbers and the distribution indicate that the average level of inflation literacy in

⁷ The six indicators are: CPI, HICP, Mikro-Warenkorb (price index of daily purchased goods; published by Statistik Austria), Mini-Warenkorb (price index of weekly purchased goods), core inflation, price index for retirees' households (published by Statistik Austria). The score is the number of known indicators divided by 6.

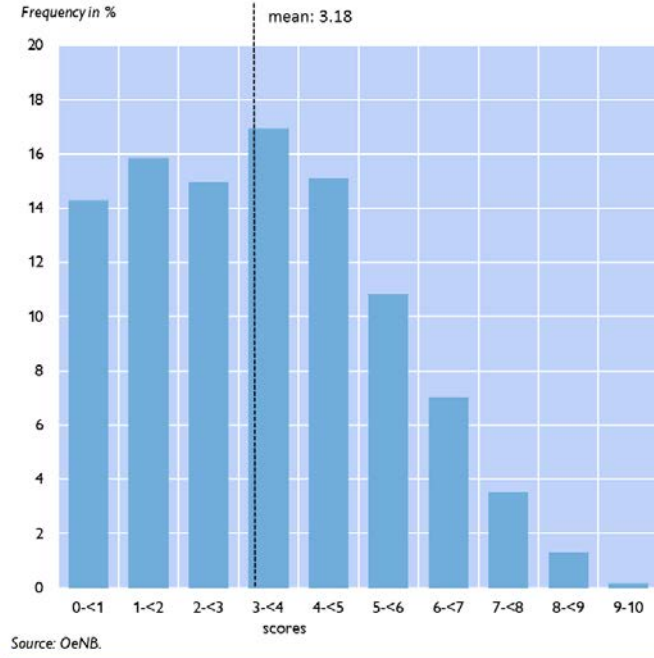
⁸ 1 if they are "very well" or "well" informed about at least one of the six indicators and 0 otherwise.

⁹ Out of five possible investment strategies (savings account, bonds, shares, gold and other precious metals, real estate) a value of 1 is assigned if the responses include shares, gold or real estate and 0 otherwise.

the Austrian population is rather low as only about 21% of all respondents have an inflation literacy score of more than 5.

Figure 1

Distribution of inflation literacy



3.3. Estimation

In our empirical analysis we want to investigate whether better knowledge about inflation and monetary policy, which we call “inflation literacy”, affects the level and the uncertainty of individuals’ inflation expectations and also whether inflation literacy has an effect on the accuracy of inflation expectations by consumers. To control for other factors that have been found to affect individual inflation expectations in the literature, we additionally include demographic and socioeconomic characteristics of the respondents in our regressions. Specifically, we regress the ordinal variables expected level of inflation (1) as well as the degree of certainty of the specified inflation expectation (2) and the continuous variable expectation error of short-term inflation expectations (3) on a number of covariates available in the dataset:

$$inf\ exp_i = \alpha + \beta_1 inf\ lit_i + \beta_2 education_i + \beta_3 income_i + \beta_4 age_i + \beta_5 age_i^2 + \beta_6 gender_i + \varepsilon_i \quad (1)$$

$$uncertainty_i = \alpha + \beta_1 inf\ lit_i + \beta_2 education_i + \beta_3 income_i + \beta_4 age_i + \beta_5 age_i^2 + \beta_6 gender_i + \varepsilon_i \quad (2)$$

$$exp\ error_i = \alpha + \beta_1 inf\ lit_i + \beta_2 education_i + \beta_3 income_i + \beta_4 age_i + \beta_5 age_i^2 + \beta_6 gender_i + \varepsilon_i \quad (3)$$

where $inf\ exp_i$ corresponds to the expected inflation stated by individual i (expressed in ranges); $inf\ lit_i$ refers to the level of the inflation literacy indicator of individual i ; $education_i$ indicates the highest educational attainment of the respondents in 3 categories; $income_i$ refers to the income of the respondents available in 3 ranges; age_i and age_i^2 denote the age and the age squared of the respondents¹⁰; $gender_i$ is a dummy for male; and ε_i is an *i.i.d.* error term. In (2) $uncertainty_i$ denotes the degree of (un)certainty of the specified inflation expectation by individual i and $exp\ error_i$ in (3) is the absolute deviation of expected inflation in 12 months by individual i from actual inflation 12 months later.¹¹ Descriptive statistics of all dependent and explanatory variables are shown in Tables A1 and A2 in the Appendix.

As mentioned before, the dependent variable in regression (1) – inflation expectations – is only available in intervals (1-percentage point intervals starting at -5% and going up to +5%) where the lower- and upper-end intervals are open (below -5% and above +5%). This induces a censoring problem in the data which has to be accounted for by an appropriate estimation strategy. An estimation method which can deal with censored interval data is the generalized tobit model – also called interval regression – where the parameters are estimated by means of maximum likelihood (see Maddala, 1983, and Stewart, 1983, for a description of this method).

In contrast, the dependent variable in regression (2) – the probability assigned to a specific expectation – is a cardinal variable as it may take 10 values ranging from 10% to 100% certainty. Thus, we can treat it as a discrete interval variable and perform multivariate ordinary-least-squares (OLS) estimation. The dependent variable in regression (3) – the deviation of expected from actual inflation in 1 year – is a quasi-continuous variable and therefore also calls for OLS estimation. In all three regressions, we use the Huber-White method to calculate standard errors of the estimated coefficients which are robust to heteroscedasticity of unknown form. Regressions (1) and (2) are estimated for both short-run and long-run inflation expectations while regression (3) can only be estimated for short-run expectations.

4. Results

The results of regression (1) for short- and long-run inflation expectations are shown in Table 1. Our main result here is that people with more knowledge about inflation and monetary policy, i.e. with a higher score of the inflation literacy indicator, have significantly lower inflation expectations both in the short as well as in the long run. A coefficient of -0.05 implies that respondents whose score of the inflation literacy indicator is 1 point higher than

¹⁰ We additionally include age squared in the estimations because Blanchflower and Mac Coille (2009) find a non-linear effect of the respondents' age on inflation expectations in UK survey data.

¹¹ Given that the survey was conducted in spring 2013, we are able to evaluate the expectation error of individuals' short-term inflation expectation *ex post*. However, this is not possible for long-run (5-10 years) inflation expectations. Inflation in Austria followed a declining trend during most of 2013 which was the main reason why most respondents overestimated inflation at the one year horizon (see also footnote 16).

the average (of 3.18), have short-run inflation expectations that are about 5 basis points lower than the average (of 2.1%). For long-run expectations, the effect of inflation literacy on the specified level of inflation expectations is almost twice as strong (-0.09).

Turning to the sociodemographic characteristics of the respondents, we find that older people have significantly higher short- and long-run inflation expectations than comparatively younger people but this effect diminishes with higher age, i.e. age has a non-linear effect on inflation expectations. The result that inflation expectations increase with age has also been documented in related papers, such as Blanchflower and Mac Coille (2009) and Pfajfar and Santoro (2008).

Table 1

Intervall regressions		
Dependent variable: short- and long-term inflation expectations		
Explanatory variables	1 year expectations	5 to 10 years expectations
inflation literacy (score 0-10)	-0.0519** (0.0215)	-0.0877*** (0.0256)
education (3 groups)	-0.0502 (0.0507)	-0.1187** (0.0605)
income (3 groups)	0.1384** (0.0671)	0.1810** (0.0803)
age (in years)	0.0382*** (0.0115)	0.0515*** (0.0126)
age²	-0.0003*** (0.0001)	-0.0004*** (0.0001)
gender (dummy for male)	-0.0919 (0.0781)	-0.1321 (0.0931)
constant	1.1377*** (0.2720)	1.5228*** (0.3050)
Observations	1,261	1,186

Note: *** p-value<0.01, ** p-value<0.05, * p-value<0.1; robust standard errors in parentheses.

Source: Authors' calculations.

The effect of educational attainment on inflation expectations, which has been widely documented in the literature (e.g. in Bruine de Bruin et al., 2010, Pfajfar and Santoro, 2008, Van der Crujssen et al., 2015), is only significant for long-run inflation expectations in our regressions. Consistent with the literature, inflation expectations are found to be lower for people with higher educational attainment. In principle, we would expect that the level of educational attainment is correlated with our main explanatory variable, the inflation literacy indicator, which could induce a problem of multicollinearity in our regressions. In fact, as shown in Table A3 in the Appendix, inflation literacy and educational attainment are only mildly correlated in our data, with a correlation coefficient of 0.3.¹² From Table A3 we can also see that inflation literacy and personal income are also positively correlated across

¹² In addition, standard tests for multicollinearity of regressors do not detect any problem of multicollinearity in our estimations (results are available upon request).

respondents (with a slightly higher correlation coefficient than the one for literacy and education).

In contrast to the related literature, however, we find significantly higher rather than lower short- and long-run inflation expectations for higher income groups. In the literature (e.g. Menz and Poppitz, 2013), heterogeneity of inflation expectations across income groups is explained with relatively higher actual inflation rates for lower-income households due to the dominance of food and energy items in their personal consumption baskets. For Austria, Fessler and Fritzer (2013) have shown that income and actual inflation rates across demographic groups are negatively correlated, but differences across groups are numerically small such that the effect of income on inflation expectations could be muted in Austria. Finally, we find that male respondents have slightly lower short- and long-run inflation expectations than females but – unlike in other studies (e.g. Bruine de Bruin et al., 2010, and Bryan and Venkatu, 2001b) – the difference is not statistically significant in our regressions.

Turning to uncertainty of inflation expectations (Table 2), we find that respondents with a relatively higher level of inflation literacy are significantly less certain when they specify their short-run and long-run inflation expectations than people with a lower level of inflation literacy. Since inflation literacy is positively correlated with educational attainment, the effect of educational attainment on individual uncertainty of inflation expectations goes in the same direction but is not significant at the 10% level. These results are at first sight at odds with what we would expect. However, in surveys where people are asked about their subjective confidence in their own judgement the overconfidence effect¹³ is a well-established bias which could be especially severe for low literacy and low numeracy groups. According to the OECD, only 13.6% of adults in Austria attain a level of proficiency in numeracy which requires “analysis and complex reasoning of [...] statistics and chance”.¹⁴ This implies that probably only few respondents of our survey can reliably gauge the uncertainty related to their expectations, while the majority is likely infected with overconfidence which may become more severe the lower the level of literacy and numeracy (and educational attainment).

Furthermore, we also do not find a significant effect of people’s income level on their inflation expectation uncertainty but for age a significant effect on expectation uncertainty is found: Comparatively older people are not only more pessimistic in their expectations than younger people but they are also relatively more certain about their short- as well as long-run inflation expectations. As for the level of inflation expectations, this effect on uncertainty diminishes with increasing age. Finally, we find that – at least for long-run expectations – men tend to be significantly more certain when specifying their inflation expectations than women, which is in line with the findings in Bruine de Bruin et al. (2009).

¹³ Hoffrage (2004) defines overconfidence as “overprecision in expressing unwarranted certainty in the accuracy of one’s beliefs”.

¹⁴ OECD (2009).

Table 2

Dependent variable:
degree of certainty of short- and long-term inflation expectations

Explanatory variables	1 year expectations	5 to 10 years expectations
inflation literacy (score 0-10)	-0.0732* (0.0374)	-0.1017*** (0.0378)
education (3 groups)	0.0442 (0.0864)	-0.0260 (0.0904)
income (3 groups)	-0.0044 (0.1176)	-0.0635 (0.1176)
age (in years)	0.0734*** (0.0219)	0.0414* (0.0216)
age²	-0.0008*** (0.0002)	-0.0004* (0.0002)
gender (dummy for male)	0.1172 (0.1284)	0.2231* (0.1309)
constant	5.6545*** (0.5201)	6.4930*** (0.4931)
Observations	1,162	1,144

Note: *** p-value<0.01, ** p-value<0.05, * p-value<0.1; OLS regression, robust standard errors in parentheses.

Source: Authors' calculations.

Burke and Manz (2014) have shown in an experiment that individuals with higher monetary policy and financial literacy tend to produce more accurate inflation forecasts. With the data at hand, we can investigate a very similar question, namely whether more knowledge about inflation and monetary policy has an effect on the (ex-post) accuracy of inflation expectations (see Table 3). Similar to Burke and Manz (2014) and Van der Crujisen et al. (2015), we find that individuals with a higher score of the inflation literacy indicator have significantly more accurate short-run inflation expectations than others. The coefficient of -0.1 indicates that people whose inflation literacy score is 1 point higher than the average, have on average 0.1 percentage points more accurate short-run inflation expectations.

As for the level of short-run inflation expectations, educational attainment does not have a significant effect on the size of the expectation errors of individuals, whereas personal income of respondents appears to be positively correlated with their expectation errors. Similarly, also for age we do not only observe a significantly positive effect on the level of short-run inflation expectations but also on the deviation of expected from actual inflation. Finally, expectation errors are found to be somewhat smaller for men than for women in our dataset but this effect is only borderline significant.

Table 3

Dependent variable:
expectation error of short-term inflation expectations

Explanatory variables	1 year expectations
inflation literacy (score 0-10)	-0.0992** (0.0155)
education (3 groups)	-0.0225 (0.0404)
income (3 groups)	0.1130** (0.0511)
age (in years)	0.0258*** (0.0084)
age²	-0.0003*** (0.0001)
gender (dummy for male)	-0.0947* (0.0576)
constant	0.7301*** (0.1768)
Observations	1,261

Note: *** p-value<0.01, ** p-value<0.05, * p-value<0.1;

OLS regression, robust standard errors in parentheses.

Source: Authors' calculations.

The fact that all coefficients in regressions (1) and (3) have the same sign is an indication that short-run inflation expectations seem to have an upward bias in our data as respondents with relatively higher inflation expectations are also the ones whose expectations deviate most from the actual outcome.¹⁵ To avoid this close relationship between level and error of inflation expectations, an alternative would be to evaluate the expectation error with respect to the consensus inflation forecast available at the time of the survey rather than ex post with respect to the actual outcome. Based on this alternative dependent variable, the results (available upon request), in particular for the effect of inflation literacy, are qualitatively very similar to the results shown in Table 3.

5. Summary and conclusions

Besides current inflation developments and inflation forecasts, inflation expectations of households are important indicators in the toolkit of central bank analysis. Understanding the formation of inflation expectations is crucial for central banks in order to assess the adequacy of their current monetary policy stance and whether inflation expectations are anchored to the target. Furthermore, knowledge of the determinants of inflation expectations of households helps central banks to gear their communication efforts towards improving the accuracy of individuals' inflation expectations.

¹⁵ On average, inflation one year ahead has been overestimated by the respondents of our survey by 0.56 percentage points and the correlation between the level and the error of short-run inflation expectations amounts to 0.63.

While there are numerous studies that investigate the role of sociodemographic factors for inflation expectations, only few papers analyze the importance of economic and financial literacy for inflation expectations (e.g. Bruine de Bruin et al., 2010, and Burke and Manz, 2014). We extend the analysis of these papers by constructing an encompassing indicator of inflation literacy which also contains elements of monetary policy and financial literacy and directly test the relevance of this indicator for the level, the uncertainty and the accuracy of inflation expectations at the micro level.

Generally, as for other indicators of economic and financial literacy analyzed in the literature, we find that the average consumer has a relatively low level of inflation literacy. Our regression results indicate that individuals with higher inflation literacy, i.e. a better knowledge of inflation, its dynamics and drivers in Austria as well as of the goals of monetary policy, tend to have lower and thus more realistic inflation expectations both in the short and in the long run. Interestingly, we also find that people with higher inflation literacy are less certain about their inflation expectations than people with lower inflation literacy. We explain this surprising result with the overconfidence effect in the assessment of the accuracy of one's own judgement which has been documented in the survey literature and which is likely more severe for lower literacy groups. Our main result, however, is that inflation literacy strongly improves the accuracy of inflation expectations evaluated ex post: the higher the level of inflation literacy of individuals, the smaller are their absolute expectations errors.

These results confirm the need to invest time in improving central bank communication and the management of inflation expectations by clarifying to the public the role of the central bank. In particular, more information on the determinants, drivers and dynamics of inflation should be given to the public, as well as a clarification of what can be influenced by the central bank and what not. A useful vehicle in this process is the publication of regular inflation reports as done by most major central banks. In addition, special efforts should be made to enhance the accessibility of the inflation report and other central bank documents for low (inflation) literacy groups as those groups have the largest potential to improve the accuracy of their inflation expectations.

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Appendix

Table A1

Descriptive statistics of the dependent variables

	1 year ahead distribution in %	5-10 years ahead distribution in %
level of inflation expectations		
below 0%	0.4	0.5
0%	8.0	3.0
0% to 1%	9.6	4.2
1% to 2%	28.0	26.6
2% to 3%	36.2	36.4
3% to 4%	10.7	11.6
4% to 5%	3.8	7.4
above 5%	3.3	10.4
mean ¹	2.1%	2.7%
standard deviation	1.3%	1.5%
number of observations	1,548	1,448
degree of certainty of inflation expectations		
		distribution in %
10% certain	1.3	0.5
20% certain	1.5	1.3
30% certain	2.5	2.8
40% certain	4.1	4.2
50% certain	17.8	20.7
60% certain	12.5	12.0
70% certain	19.3	18.5
80% certain	17.1	16.4
90% certain	7.0	7.0
100% certain	16.7	16.6
mean	69.5%	69.4%
standard deviation	21.0%	20.5%
number of observations	1,425	1,405
absolute inflation expectations error		
mean ¹ (in percentage points)	1.07	
standard deviation (pp)	0.96	
number of observations	1,548	

¹ mean calculated using midpoints of ranges.

Source: OeNB-Barometer survey conducted by IFES in the second quarter of 2013.

Table A2

Descriptive statistics of the explanatory variables

	%	Cumulative %
Inflation literacy (score)		
0 to <1	14.3	14.3
1 to <2	15.9	30.1
2 to <3	15.0	45.1
3 to <4	16.9	62.0
4 to <5	15.1	77.1
5 to <6	10.8	88.0
6 to <7	7.0	95.0
7 to <8	3.5	98.5
8 to <9	1.3	99.8
9 to 10	0.2	100.0
mean	3.18	
standard deviation	2.13	
Education		
Lower secondary (compulsory school, apprenticeship)	71.5	71.5
Higher secondary (high school)	15.4	86.9
Tertiary (university or college)	13.1	100.0
Income		
Low (less than EUR 1,050 per month)	22.3	22.3
Medium (EUR 1,050 to EUR 2,099 per month)	38.2	60.5
High (more than EUR 2,100 per month)	9.6	70.1
Not specified	24.8	94.9
No own income	5.1	100.0
Age		
mean	46.8	
standard deviation	18.6	
Gender		
Male	48.4	48.4
Female	51.6	100.0

Notes: number of observations: 2,000.

Source: OeNB-Barometer survey conducted by IFES in the second quarter of 2013.

Table A3

Correlation coefficients among explanatory variables

	Inflation literacy	Education	Income	Age	Gender
Inflation literacy	1				
Education	0.30	1			
Income	0.32	0.25	1		
Age	0.06	-0.03	0.17	1	
Gender	0.14	-0.01	0.25	-0.07	1

Notes: number of common observations: 1,464.

Source: OeNB-Barometer survey conducted by IFES in the second quarter of 2013.