

# Nexus between Inflation, Inflation Perceptions and Expectations<sup>†</sup>

By MINHO NAM AND MINJI GO\*

*We uncover a nexus between actual inflation, inflation perceptions and expectations in Korea through analyzing micro as well as aggregate data from the Consumer Survey. We document two novel findings. First, households' subjective perceptions of inflation exert more impact on expectation formation than actual inflation. Second, inflation perceptions are broadly in line with the trajectory of the inflation trend. This is attributable to the fact that changes in actual inflation have been generated mainly by the consumption items whose price changes are perceived more sensitively as those items are frequently bought or have a larger share in household expenditures. Conducting a cross-country comparison, we find that information rigidity in expectation formation process and the nexus between perceptions and expectations of inflation prove to be stronger in Korea. Additionally, we reconfirm the existing finding that the scope of information utilized for forming inflation expectations is fairly circumscribed.*

Key Word: Inflation Expectations, Inflation Perceptions,  
Expectation Formation, Information Rigidity,  
Monetary Policy

JEL Code: D84, E31, E52

## I. Introduction

Inflation expectations are deemed to affect actual inflation through pricing and wage negotiation of economic agents. Accordingly, if inflation expectations become unstable, actual inflation will become volatile, making it difficult for central banks to achieve price stability target and possibly lowering the credibility

\* Nam: (first and corresponding author) Bank of Korea (e-mail: [minho@bok.or.kr](mailto:minho@bok.or.kr)); Go: (coauthor) Bank of Korea (e-mail: [mjgo@bok.or.kr](mailto:mjgo@bok.or.kr))

\* Received: 2018. 6. 14

\* Referee Process Started: 2018. 6. 25

\* Referee Reports Completed: 2018. 8. 25

† The views expressed in this paper are strictly those of the authors. They do not necessarily represent the views of the Bank of Korea. We are deeply grateful to Roberta Friz at the European Commission for providing the data on inflation perceptions and expectations in the Euro area and to Yushin Bu at the Bank of Korea for calculating the contribution of each consumption item group to changes in inflation graphed in Figure 6 in the paper.

of monetary policy. As such, inflation expectations can directly affect the effectiveness of monetary policy. Hence, it is one of the foremost tasks of central banks to discover the causes of changes in inflation expectations and strive persistently to explore alternative measures to stabilize them. One of the prerequisites for fulfilling that task successfully is to secure a firm understanding of how households form their inflation expectations.

In modern macroeconomic theory, it is assumed that economic agents are forward-looking and form expectations in a rational manner, *i.e.*, utilizing all available information at the time of expectation formation. However, considering the findings from existing foreign studies which attempted to uncover how inflation expectations are formed through various methods, such as empirical analyses, surveys and experiments, households are more likely to form inflation expectations in a backward-looking manner using fairly limited, not full, information (Blanchflower and MacCoille, 2009; Rowe, 2016; Bank of Japan, 2016). In a similar vein, research on inflation expectations in Korea commonly shows that households' inflation expectations (1) are formed while depending heavily on past inflation information; (2) move in tandem with, and do not precede, actual inflation; and (3) show systematic forecast errors in relation to actual inflation. In particular, Lee (2012) finds through a correlation analysis that inflation expectations comove with inflation at the time of expectation formation rather than future inflation over the sample period from January 2000 to October 2011. Likewise, a vector autoregression (VAR) analysis in that paper reveals that inflation expectations turn out to be affected mainly by historical inflation. Choi (2012) estimates the proportion of the households whose expectations are formed in an adaptive manner to be around 60% using a sample spanning from February 2002 to June 2012. As a result, the persistence of inflation expectations in Korea proves to be stronger compared to that in the US, the UK, Sweden and New Zealand. Lee (2012) and Choi (2012) commonly confirm the existence of systematic bias in inflation expectations with regard to actual inflation.

Indisputably, those studies have greatly advanced our understanding of inflation expectation formation which had been recognized as a black box. However, the possibility that subjective inflation perceptions may play an important role in forming inflation expectations and they can account for the observed strong nexus between actual inflation and inflation expectations has been overlooked. To the best of our knowledge, there exists no academic attempt to verify these hypotheses in Korea. Even in overseas research, efforts to explore a link connecting inflation, its perceptions and expectations altogether appears to be scarce, although studies which examine inflation perceptions are abundant.

There is an additional limitation in the existing research on inflation expectations in Korea in that those studies used mainly pre-2013 data on inflation expectations which were compiled while providing survey respondents with *an average inflation rate over the last 12 months*. Therefore, the survey question *per se* may have induced households to form expectations in a backward-looking manner.<sup>1</sup>

<sup>1</sup>Choi (2012) raised the possibility that the provision of inflation information on the Consumer Survey questionnaires caused inflation expectations to be nearly equal to actual inflation. To resolve this issue, the Bank of Korea which conducts the Consumer Survey decided not to provide historical inflation on the questionnaire starting in 2013. This new survey method changed fundamentally the property of data on inflation expectations.

Motivated by these considerations, we analyze the relationships between actual inflation, inflation perceptions and expectations using the data from the Consumer Survey. Our analysis consists of three parts. In the first part, we attempt to validate the high level of correlation between actual inflation and inflation expectations documented in earlier work using post-2013 data which were compiled without providing survey respondents with inflation information. To take an additional step from a correlation analysis, we attempt to verify whether there exists a causality running from actual inflation to inflation expectations and examine the relationship between perceptions and expectations of inflation. From the results of these analyses, we derive a hypothetical reason why actual inflation, inflation perceptions and expectations are closely associated and then substantiate it by probing into item-level data in the CPI (Consumer Price Index) and microdata from the Consumer Survey.

In the second part of the analysis, we conduct a cross-country comparison to assess to what extent our findings on expectation formation in Korea can be generalized. We analyze data from the four advanced economies of the U.S, the Euro area, the UK and Japan, and survey a wide range of related empirical studies from overseas. In the last part, we estimate the scope of information households utilize when forming inflation expectations in Korea and then present the findings documented in overseas studies.

The following novel findings in this paper are expected to contribute to the literature along these three lines. First, inflation expectations are affected more strongly by inflation perceptions than by actual inflation. Secondly, the apparently strong correlation between inflation expectations and actual inflation stems from the fact that inflation perceptions closely follow the trend of actual inflation. In turn, the reason for why households perceive the past trend of inflation somewhat accurately is that changes in actual inflation have been generated mainly by the consumption items whose price changes are perceived more sensitively by households as they are frequently bought or take a larger share of household expenditures. Lastly, a cross-country comparison, rarely conducted in the literature, reveals that the inflation expectations of households are formed in a backward-looking manner in general and that the nexus between inflation perceptions and expectations in Korea is stronger compared to that in advanced economies.

The paper proceeds as follows. Section II presents evidence of the nexus between actual inflation, inflation perceptions and expectations. Section III provides commonalities and differences in how households in Korea and in the aforementioned advanced economies form inflation expectations. Section IV presents the result of an analysis regarding the scope of information used when forming expectations and presents the findings of relevant overseas studies. Section V concludes with a summary and policy implications.

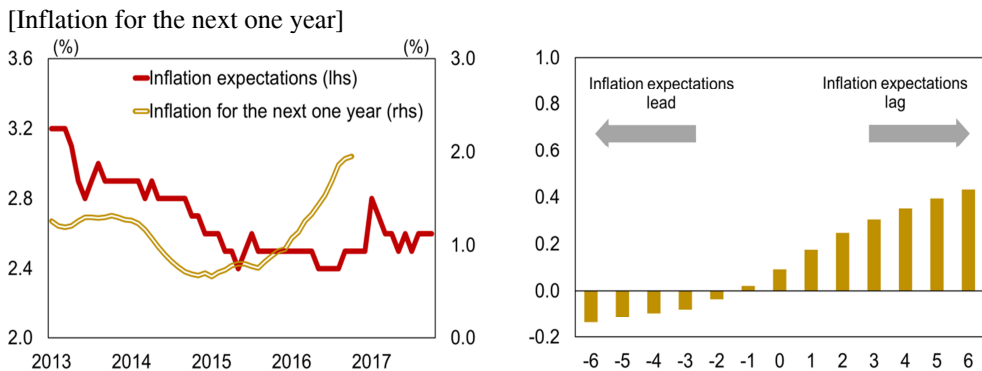
## **II. Nexus between Inflation Perceptions and Expectations**

In this section, we make an attempt to reveal a hidden nexus between inflation,

inflation perceptions and expectations.<sup>2</sup> We start by defining the key terms which are used in this paper. Henceforth, *inflation* refers to the CPI inflation rate announced by Statistics Korea. It is also expressed as *actual inflation* to make it clearly distinct from inflation perceptions and expectations. *Inflation expectations* refer to households' forecast for one-year ahead inflation and *inflation perceptions* mean the perceived level of inflation over the last year the data for which are compiled by the Consumer Survey of the Bank of Korea. *Past inflation* and *future inflation* mean the average CPI inflation rate for one year before and after a certain time point, respectively.

### A. Nexus between Actual Inflation and Inflation Expectations

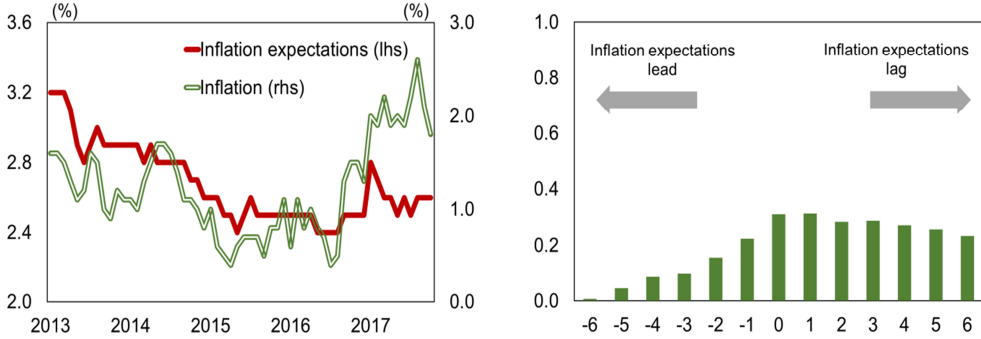
As mentioned in the introduction, the previous studies on inflation expectations in Korea share a common finding irrespective of differences in the methods and time periods of analysis used: inflation expectations are formed in a backward-looking manner.<sup>3</sup> In order to check whether this commonality is still valid using post-2013 data, the coefficients of cross-correlation are estimated between inflation expectations and actual inflation at three different time horizons, *i.e.*, over the past one year, at the time of expectation formation and over the next year. The sample period starts from January 2013, when the new method of questioning households about their forecasts for inflation was introduced, and ends with October 2017. In Figure 1, the panels on the left show the trend of actual inflation and its expectations. Those on the right in the same figure present the coefficients of the cross-correlation between the two indicators.



<sup>2</sup>A variety of methods are used to measure inflation expectations, which are non-observable in nature. There are two typical measures: survey-based and market-based indicators. Survey-based indicators are compiled by aggregating the collected forecasts for future inflation data from a group of economic agents, such as households, corporations and experts. Market-based indicators include the break-even inflation rate (BEI) referring to the gap between the yields of inflation-linked government bonds and plain government bonds, and inflation-linked interest rates applied to transactions of inflation swaps, a derivative for transferring inflation risk.

<sup>3</sup>Lee (2012) estimated the correlation between actual inflation and inflation expectations for the period from February 2002 to October 2011. Lee and Choi (2015) and Choi (2012) used a regression analysis to estimate the relationship between those two indicators for the period from February 2002 to December 2012 and from February 2002 to June 2012, respectively. All of these studies show that inflation expectations are formed in a backward-looking manner. However, as noted earlier, the analysis periods in these studies end before 2013, with survey respondents given the information about the past CPI inflation rates.

[Inflation at the time of expectation formation]



[Inflation over the past one year]

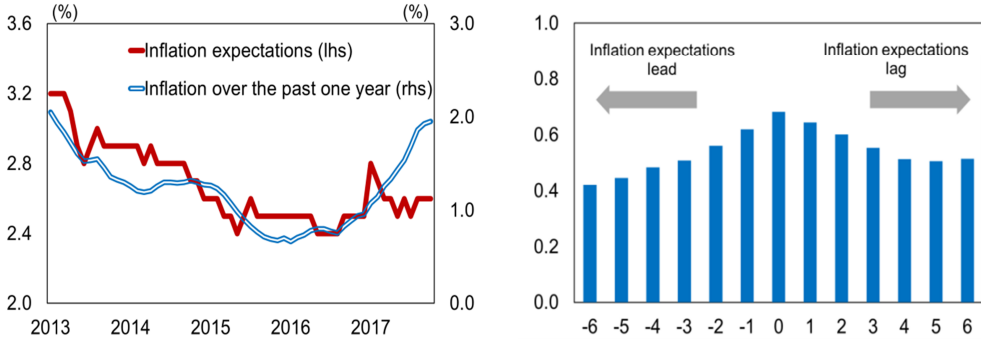


FIGURE 1. CROSS-CORRELATION BETWEEN INFLATION EXPECTATIONS AND ACTUAL INFLATION

Source: Bank of Korea; Statistics Korea; Authors' calculations.

To take one step beyond the correlation analysis above, we test whether past inflation has any causal effect on inflation expectations. The following regression model in Ehrmann (2015) is estimated for the same sample period used in the correlation analysis above.<sup>4</sup>

$$(1) \quad \pi_t^e = \alpha + \beta_1 \pi_{t-n}^{aver} + \beta_2 D_t + \beta_3 D_t \pi_{t-n}^{aver} + \varepsilon_t$$

where  $\pi_t^e$  refers to inflation expectations at time  $t$  and  $\pi_{t-n}^{aver}$  is the average of past inflation from time  $t-n$  to  $t$ . The dummy variable  $D_t$  denotes the period in which past inflation continued to rise. It is included to examine whether the influence of past inflation on inflation expectations varies depending on the phases of the inflation trend. The dividing time point between the *inflation-rising* and *inflation-declining* phases is set as September 2016 based on the results of a

<sup>4</sup>In Ehrmann (2015), the entire sample period is divided into two categories depending on whether or not the inflation of the preceding month exceeds the inflation target. Assigning dummies to one type of period, Ehrmann (2015) examines whether the dependence of inflation expectations on actual inflation varies depending on the periods. Unlike Ehrmann (2015), we divide the sample period into only two parts depending on whether or not inflation continues to rise.

structural break test.<sup>5</sup> Specifically, the *inflation-declining* phase lasts from January 2013 to August 2016 and naturally the other part of the sample period, from September 2016 to October 2017, is defined as the *inflation-rising* period. Therefore, the regression coefficient  $\beta_1$  represents the dependency of inflation expectations on past inflation in the *inflation-declining* phase and  $\beta_1 + \beta_3$  denotes that for the *inflation-rising* phase.

As shown in Table 1 below,  $\beta_1$  is estimated to belong to the interval of [0.49, 0.61], which implies that inflation expectations in the *inflation-declining* phase react sensitively to actual inflation. In more detail, it is estimated that the average inflation over the *past* three to twelve months has a greater impact on inflation expectations than *current* inflation. From this result, it can be inferred that households regard the longer-term trend of past inflation as more important than the most recent inflation when forming expectations.<sup>6</sup> On the other hand, in the *inflation-rising* phase, inflation expectations are estimated to still be less dependent on actual inflation than in the *inflation-declining* phase given that the estimates of  $(\beta_1 + \beta_3)$  are in the interval of [0.03, 0.10], i.e., close to zero.

However, these estimation results cannot be viewed as a weakening in the backward-looking nature of inflation expectations in the *inflation-rising* era. Considering that actual inflation has continued to rise since the second half of 2016 while inflation expectations remain nearly flat within the narrow range of 2.5%-2.6% as indicated in the bottom left panel of Figure 1, it is more convincing to regard the results as an indication that households became less attentive to recent inflation information over the same period. This can be considered a puzzle in that the participants in overseas experimental studies show a tendency to be more sensitive to hikes than reductions in prices. One possible explanation is that households in Korea might not actively update inflation information expecting inflation to remain low as it had been at a historically low level for a prolonged period. However, this hypothetical proposition must be corroborated through an additional analysis after a longer time series of inflation expectations is secured.

TABLE 1—ESTIMATED RESULTS: LINK BETWEEN ACTUAL AND INFLATION EXPECTATIONS

	$\alpha$	$\beta_1$	$\beta_2$	$\beta_3$	$\beta_1 + \beta_3$	$R^2$	$F$ statistics
$n=0$ (current)	2.21***	0.49***	0.19	-0.39***	0.10	0.62	29.30***
$n=2$ (3-month average)	2.11***	0.57***	0.38***	-0.52***	0.05	0.69	40.87***
$n=5$ (6-month average)	2.05***	0.61***	0.46***	-0.56***	0.05	0.74	52.42***
$n=11$ (12-month average)	2.02***	0.59***	0.52***	-0.56***	0.03	0.80	72.99***

Note: 1) \*\*\* denotes statistical significance at the 1% level. 2) The Newey-West HAC estimator is used for generating the variance-covariance matrix of the residuals.

<sup>5</sup>The structural break point is estimated by an autoregression model using CPI to conform to the purpose of the regression analysis above.

<sup>6</sup>The result showing that inflation expectations are significantly affected by past inflation suggests that the inflation target scarcely influences inflation expectations. This hypothesis, however, must be verified by estimating a regression equation with different explanatory variables. According to a recent study, in New Zealand which introduced inflation targeting for the first time, 88% of all respondents to a business executive survey reported that their own purchasing experiences are most important when forming inflation expectations (Kumar *et al.*, 2015).

## B. Nexus between Inflation Perceptions and Expectations

Numerous foreign studies have shown that the inflation expectations of households are influenced not only by objective information on, *e.g.*, inflation, business and economic policy but also by subjective inflation perceptions.<sup>7</sup> In Figure 2, the perceptions and expectations of inflation in Korea appear to be nearly identical during the sample period from January 2013 to October 2017 in Korea. The average gap between these two indicators is merely 0.05%p. Naturally, the correlation coefficient between the expectations and perceptions of inflation is 0.97, *i.e.*, close to one. On the other hand, the coefficient of the correlation between actual inflation and inflation expectations is 0.68, far from one, and the average gap between these two amounts to 1.47%p. Most remarkable is that the correlation coefficient between inflation perceptions and actual inflation is estimated to be as high as 0.72. This suggests that households perceive the trend, but not the level, of inflation relatively accurately.

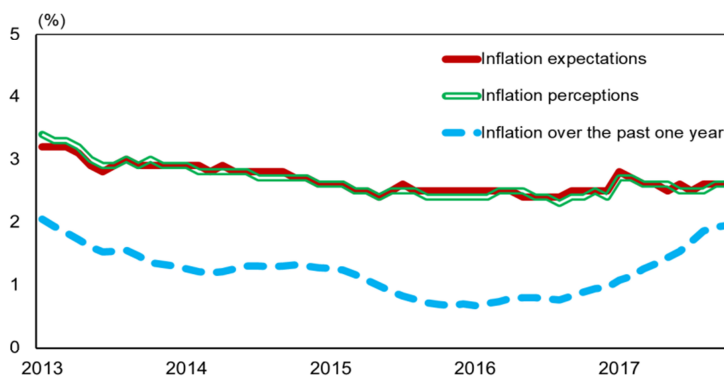


FIGURE 2. INFLATION, INFLATION EXPECTATIONS AND PERCEPTIONS

Source: Bank of Korea; Statistics Korea.

TABLE 2—CORRELATION AND GAP BETWEEN INFLATION, INFLATION EXPECTATIONS AND PERCEPTIONS

	Correlation	Mean Absolute Deviation (%p)
Perceptions and Expectations	0.97	0.05
Perceptions and Actual Inflation	0.72	1.45
Expectations and Actual Inflation	0.68	1.47

Note: 1) The sample period is from January 2013 to October 2017. 2) Inflation is the average CPI inflation rate over the past one year.

<sup>7</sup>According to the Household Survey conducted by the Bank of England in February 2008, about half of the respondents noted that their own inflation perceptions are the most important determinant of inflation expectations (Benford and Driver, 2008).

Parenthetically, the notion that inflation perceptions are important in forming inflation expectations appears to have attracted attention even in the 1980s. ("The perceived rate of inflation, that is, the public's knowledge about the historical behavior of the price level, plays an extremely important—although little observed—role in much of recent work on the formation of inflationary expectations," Jonung (1981)). However, research on the determinants of inflation perceptions became active only after the 2000s.

To test whether a causality runs from inflation perceptions to inflation expectations, the following model is estimated for the period from January 2013 to October 2017. Considering the cointegrated relationship between the perceptions and expectations of inflation and the minute differences between those two variables, the model is expressed in an error correction form.<sup>8</sup>

$$(2) \quad \Delta\pi_t^e = \alpha + \beta\Delta\pi_t^p + \gamma GAP_{t-1} + \varepsilon_t$$

where  $\pi_t^e$  and  $\pi_t^p$  refer to inflation expectations and inflation perceptions, respectively.  $GAP_{t-1}$  denotes the estimate of the long-run equilibrium error between the perceptions and expectations of inflation.<sup>9</sup> According to the estimation results, the coefficient  $\beta$  representing the impact of inflation perceptions on inflation expectations turns out to be significant at the 1% level.

Next, to compare the effects of inflation perceptions with those of actual inflation on inflation expectations, we re-estimate  $\beta$  after substituting the average inflation over 12 months  $\pi_{t-12}^{aver}$  for the inflation perceptions  $\pi_t^p$  in the equation (1) above. The result presented on the right-hand side of Table 3 shows that actual inflation is estimated to be insignificant.

Microdata from the Consumer Survey also lend firm support to the hypothesis that inflation perceptions are an overriding determinant of inflation expectations. In the individual responses of the survey, 68% of the respondents on average expected one-year-ahead inflation to be equal to the currently perceived level of inflation during the same period as in the analysis above.<sup>10</sup> Although this proportion varies slightly depending on the interval of expected inflation, it is approximately 70% in all intervals as shown in Figure 3.<sup>11</sup>

Notable is that for the respondents whose forecasts are in the range of 0% to 3%, which is close to the range of actual inflation, 0.4% to 2.6% during the sample period, the tendency to expect future inflation to be equal to inflation perceptions is found to be stronger. If these respondents had had relatively more opportunities to ascertain that their inflation perceptions were close to actual inflation by updating inflation information, this would have enhanced their trust in their own perceptions and hence strengthened their backward-looking inclination.<sup>12</sup>

<sup>8</sup>Equation (2) represents the short-term dynamics of the relationship between inflation perceptions and expectations and the  $GAP$  term refers to short-term deviations from the long-run equilibrium. We ascertain that there exists at least one cointegrating vector between inflation perceptions and expectations through a Johansen cointegration test, which implies the existence of a long-run equilibrium relationship between those two variables.

<sup>9</sup>That long-run equilibrium error indicates the estimate of the error term  $\xi_t$  in the following long-term equilibrium equation.

$$\pi_t^e = l + \delta\pi_t^p + \xi_t$$

<sup>10</sup>By age group, the average percentage of respondents with inflation perceptions are equal to inflation expectations is 64.3% in their 20s, 68.9% in 30s, 70.4% in 40s, 67.4% in 50s, and 65.6% in 60s or older. The percentages for respondents in their 30s and 40s are higher. By gender for this measure, males are at 68.2%, higher than females, for whom this rate is 64.6%.

<sup>11</sup>In the Consumer Survey, the question on inflation expectations is designed such that respondents select one of 1%p-wide intervals in the range of 0% to 6%. For more detailed information about this, the reader can refer to Appendix A. *Consumer Survey Questions about Inflation Perceptions and Expectations*.

<sup>12</sup>From the perspective of Bayesian learning, if one assigns a high weight to prior belief about actual inflation



TABLE 3—IMPACT OF PERCEIVED AND ACTUAL INFLATION ON INFLATION EXPECTATIONS

Inflation Perceptions ( $\pi_t^p$ )	Inflation over the past year ( $\pi_{t-12}^{aver}$ )
0.79***	0.18
$R^2 = 0.57, DW = 2.09$	$R^2 = 0.12, DW = 2.23$

Note: 1) The *impact* refers to the regression coefficient  $\beta$  of the equation (2). 2) \*\*\* denotes statistical significance at the 1% level.

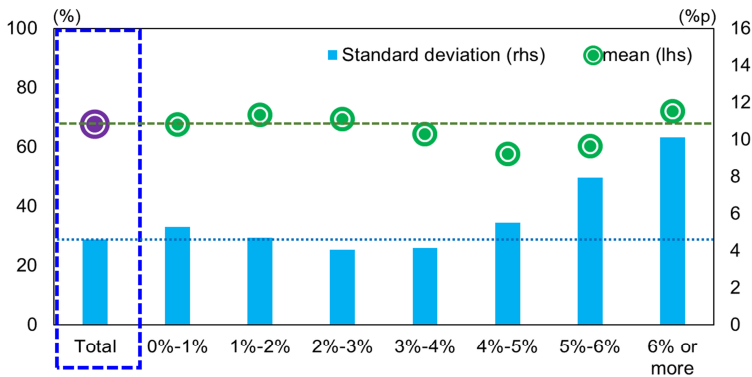


FIGURE 3. PROPORTION OF RESPONSES EXPECTING FUTURE INFLATION TO BE EQUAL TO INFLATION PERCEPTIONS

Note: The proportion is the average proportion from January 2013 to October 2017.

Source: Bank of Korea; Statistics Korea.

### C. Synthesis: Nexus between Actual Inflation, Inflation perceptions and Expectations

Based on the analysis results presented above, we can reaffirm the common view that the inflation expectations of households in Korea are formed in a backward-looking manner. Moreover, two novel findings derive from the results which are overlooked in existing domestic studies. First, inflation expectations are more strongly influenced by subjective inflation perceptions than by actual inflation. Second, the reason for the close correlation observed between actual inflation and inflation expectations is that inflation perceptions, exerting a decisive impact on inflation expectations, are approximately in line with movements in the trend of actual inflation. This second finding implies that households in Korea have recognized inflation trends correctly to a large extent. Then, a question arise here how common households can perceive the inflation trend with such exactness.

As a possible rejoinder, we propose that changes in actual inflation have been led mainly by consumption items whose price changes are remembered more clearly as they have larger proportions in household expenditures and hold high purchasing frequencies. This hypothesis can be corroborated if the following two propositions prove to be true in order: first, inflation perceptions have been more

---

in the process of forming expectations, information friction such as forecast error occurs, as hesitation can arise whether to accept new inflation information (Cavallo *et al.*, 2017).

closely correlated with the price inflation of those items than that of other items, and second, the price inflation of those items of interest has contributed considerably to changes in actual inflation.

Regarding the first proposition, as shown in Figure 4, the correlation coefficients are higher between inflation perceptions and the price changes in the following five item groups, *rent*, *textiles*, *household utilities*, *fuel* and *processed food*, which are frequently bought and which command large proportions of household expenditures.<sup>13</sup> This is true also for the composite price index for those items. As indicated in Figure 5, the correlation coefficient is 0.76 between inflation perceptions

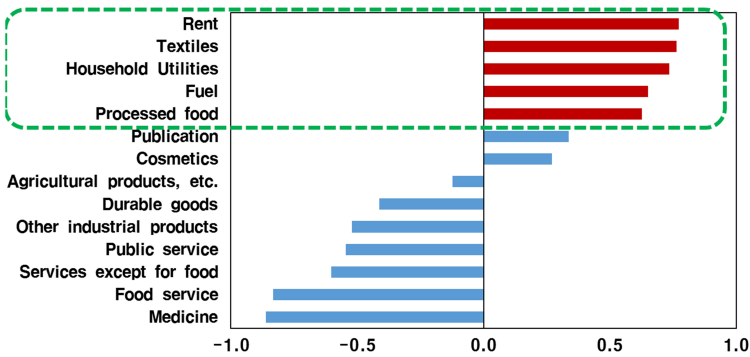


FIGURE 4. CORRELATION BETWEEN INFLATION PERCEPTIONS AND PRICE INFLATION BY ITEM GROUP

Note: 1) The sample period is from January 2013 to October 2017. 2) Price inflation is the average over the past one year.

Source: Authors' calculations.

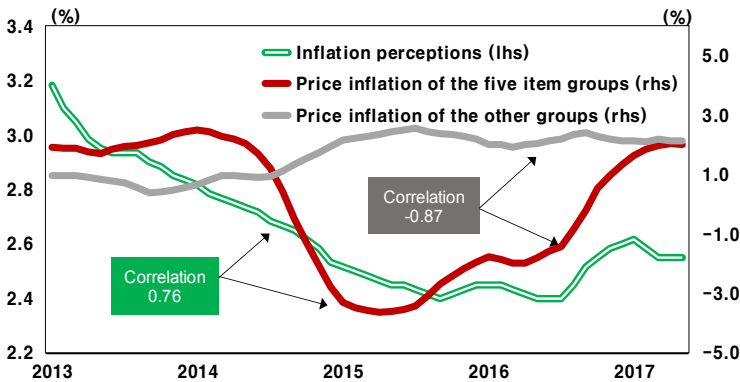


FIGURE 5. INFLATION PERCEPTIONS AND THE GROWTH RATES OF THE COMPOSITE PRICE INDICES ITEM GROUPS

Note: 1) The five item groups are *rent*, *textile*, *household utilities*, *fuel* and *processed food*. 2) Inflation perceptions and the growth rates of the composite indices are the six-month moving average.

Source: Bank of Korea; Authors' calculations.

<sup>13</sup>According to the data of the Household Survey conducted by Statistics Korea from 2013 to 2016, the average expenditure shares on *rent*, *textiles*, *household utilities*, *fuel* and *processed food* out of total expenditures are 6.7%, 2.8%, 3.6%, 9.0%, and 10.2%, respectively, substantially higher than those of other item groups.

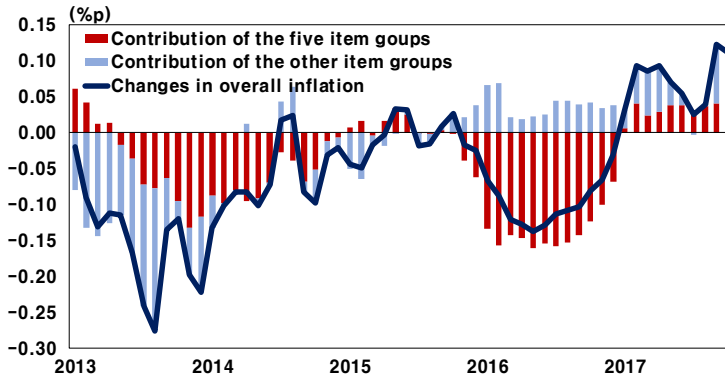


FIGURE 6. CONTRIBUTION BY ITEM GROUP TO INFLATION FLUCTUATIONS

Note: 1) The five item groups are *rent, textile, household utilities, fuel and processed food*. 2) Inflation is the average over the past one year and does not include the effect of an increase in the tobacco tax in January 2016. 3) Changes in inflation are month-to-month changes of inflation itself.

Source: Statistics Korea; Authors' calculations.

and the growth rate of the composite price index of those five item groups, whereas the same indicator for the other item groups is negatively correlated with inflation perceptions.

At this stage, it is necessary to provide evidence of the second proposition to substantiate the hypothesis presented above. In Figure 6, the five item groups whose price inflation levels are highly correlated with inflation perceptions account for a considerable share of the changes in overall inflation.

Synthesizing all of the pieces of evidence presented above, it can be concluded that households could track the trend of actual inflation accurately, as the item groups strongly affecting inflation perceptions contributed substantially to overall inflation fluctuations.<sup>14</sup> This synthesis reveals that inflation perceptions act as a hidden hinge linking inflation expectations and actual inflation.

### III. Cross-country Comparison with Advanced Economies

In this section, we conduct a cross-country comparison to assess to what extent our findings regarding expectation formation in Korea can be generalized. By analyzing the data from the four advanced economies, *i.e.*, the US, the Euro area, the UK, and Japan and surveying overseas research findings, we derive certain commonalities and peculiarities of each individual economy in terms of expectation formation.<sup>15</sup>

<sup>14</sup>The contribution to overall inflation fluctuations of the item group of *agricultural products, livestock, marine products* is not minor, but its correlation with inflation perceptions is quite tenuous. This outcome is mysterious considering that price changes in this item group should be discerned more clearly, as households purchase these products frequently as part of their daily lives. To infer, this stems from the fact that consumers are aware that prices of this item group are highly volatile due to irregular factors such as weather and seasonal factors and that they return to their long-term trend quickly. Hence, it is likely that households dismiss the price changes of such products when perceiving inflation.

<sup>15</sup>Statistical agencies in the Euro area including Eurostat have been amassing internally the unpublished

### A. Effects of Past Inflation on Expectations

Numerous studies from advanced countries have also shown that inflation expectations are formed in a backward-looking manner. Blanchflower and MacCoille (2009), Rowe (2016) and Bank of Japan (2016) present survey results which reveal that personal purchasing experiences in the past exert a significant effect on expectation formation. Specifically, in Rowe (2016), the respondents report that recently perceived price changes in retail stores over the past twelve months as the most important determinant of their inflation expectations as shown in Figure 7. That survey result is surprisingly in good agreement with the data analysis outcome presented in the previous section showing that inflation perceptions in Korea play the foremost role in the process of forming inflation expectations. In addition, Ehrmann (2015) presents an empirical finding which shows that inflation expectations are formed in a backward-looking manner by estimating the extent to which inflation expectations react to actual inflation in 15 advanced countries.<sup>16</sup>

With the same method used in Section II, we examine the correlation between inflation expectations and actual inflation at three different time horizons. Considering Table 4, it is notable that the correlation coefficients of *current* and *future* inflation in all four advanced economies are higher than those for Korea. This suggests that households in those economies are more active in updating inflation information. When comparing the coefficients by time horizon in the individual economies, the correlation coefficients of *past* inflation in the Euro area and Japan are higher than those of *current* and *future* inflation. In the US and the UK, the correlation coefficient of *current inflation* is highest, but is nearly identical to that of *past* inflation.

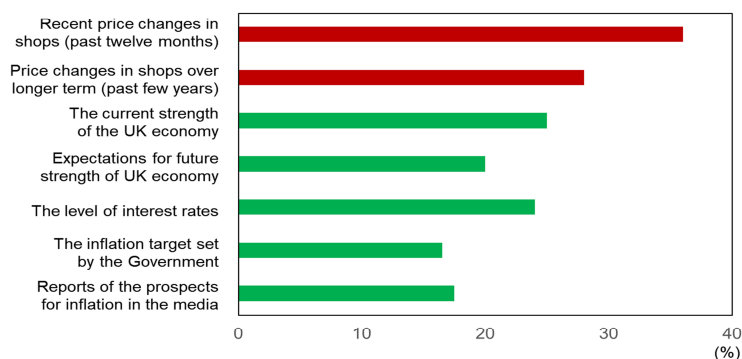


FIGURE 7. IMPORTANT FACTORS REPORTED AS DETERMINING INFLATION EXPECTATIONS IN THE UK

Source: Rowe (2016).

---

results of consumer surveys on inflation perceptions and expectations conducted at the level of individual EU member states since 2004. We obtained the data from January 2004 to July 2015 from Roberta Friz, one of the authors of Arioli *et al.* (2016) who compiled the data of inflation perceptions and expectations at the Euro area level based on the unpublished national survey results.

<sup>16</sup>Easaw *et al.* (2013) presents similar survey results for Italy.

TABLE 4—CORRELATION BETWEEN INFLATION EXPECTATIONS AND ACTUAL INFLATION AT THREE DIFFERENT TIME HORIZONS

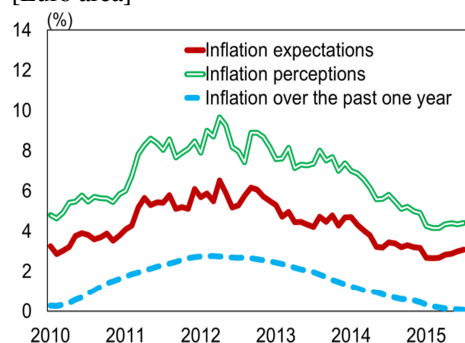
	US	Euro area	UK	Japan	Korea
Past Inflation	0.46	0.93	0.89	0.64	0.68
Current Inflation	0.52	0.82	0.90	0.53	0.31
Future Inflation	0.42	0.54	0.76	0.57	0.09

Note: 1) Past and future inflation refer to the average CPI inflation rate over the 12 months before and after the time of expectation formation, respectively. Current inflation means the CPI inflation rate at the time of expectation formation. 2) The sample period is from January 2010 to September 2017 for the US, from January 2010 to July 2015 for the Euro area, from Q1 2010 to Q3 2017 for the UK and Japan, and from January 2013 to October 2017 for Korea. 3) The data used for the Euro area come from Arioli *et al.* (2016).

### B. Effects of Past Inflation Perceptions on Expectations

The tables on the right in Figure 8 below present the correlation coefficients between actual inflation, inflation perceptions and expectations during the period from 2010 to 2017 in the Euro area, the UK and Japan.<sup>17</sup> The correlation coefficients between perceptions and expectations are 0.97 and 0.93 for the Euro area and the UK, respectively, similar to that of Korea. In Japan, it is relatively low compared to the other economies at 0.72 but is still high considering an absolute standard. On the other hand, in the US, where no data on inflation perceptions are available, recent surveys found that most respondents expected the future inflation rate to be close to the recent level of actual inflation (Detmeister *et al.*, 2016).<sup>18</sup> Considering all of the results from this cross-country analysis, it can be concluded that households' subjective perceptions in general play the most vital role in the formation of inflation expectations.

[Euro area]

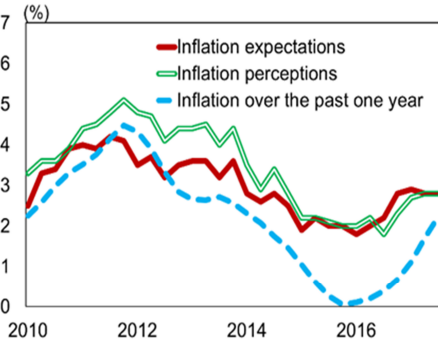


	Correlation	Mean absolute deviation (%p)
Perceptions & Expectations	0.97	2.38
Perceptions & Actual Infl.	0.94	5.19
Expectations & Actual Infl.	0.93	2.82

<sup>17</sup>The sample periods for the UK and Japan are identical, from Q1 2010 to Q3 2009, and that for the Euro area is from January 2010 to July 2015. The UK and Japan compile data on inflation perceptions and expectations on a quarterly basis. The data for the Euro area come from Arioli *et al.* (2016).

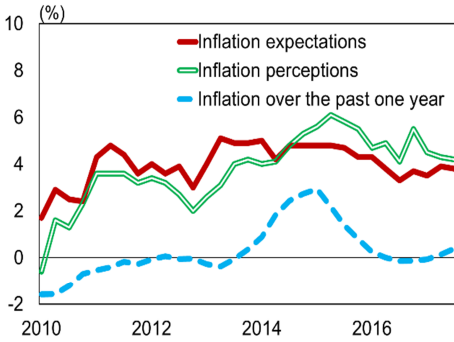
<sup>18</sup>The Federal Reserve asked the survey agency to add a new question about inflation perceptions to the existing questionnaire of the University of Michigan survey and to conduct surveys four times in 2016 using the augmented questionnaire. The results presented above are based on the two surveys conducted in February and May of 2016.

[UK]



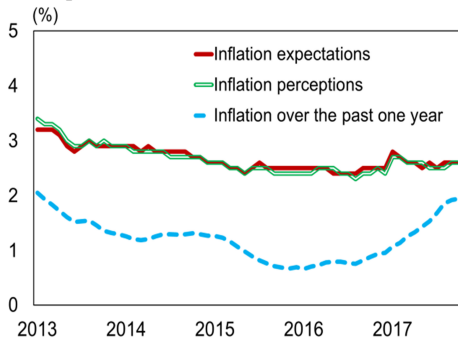
	Correlation	Mean absolute deviation (%p)
Perceptions & Expectation	0.93	0.49
Perceptions & Actual Infl.	0.95	1.23
Expectations & Actual Infl.	0.89	0.94

[Japan]



	Correlation	Mean absolute deviation (%p)
Perceptions & Expectation	0.72	0.91
Perceptions & Actual Infl.	0.77	3.50
Expectations & Actual Infl.	0.64	3.73

[Korea]



	Correlation	Mean absolute deviation (%p)
Perceptions & Expectation	0.97	0.05
Perceptions & Actual Infl.	0.72	1.45
Expectations & Actual Infl.	0.68	1.47

FIGURE 8. CORRELATION AND GAP BETWEEN INFLATION EXPECTATIONS, PERCEPTIONS, AND ACTUAL INFLATION

Note: 1) The data used for the Euro area come from Arioli *et al.* (2016). 2) To ensure the statistical significance of the correlation coefficients, the sample period for the UK and Japan is extended to 2010 because these two countries compile data on inflation expectations and perceptions on a quarterly basis. 3) Actual inflation means the average inflation over the past one year.

Source: National statistical office and the central bank of each country; Arioli *et al.* (2016).

However, gaps between inflation perceptions and expectations in the advanced economies are larger than in Korea and vary with time appreciably, as indicated in Figure 9. It is deducible from the difference that in Korea, stronger is households' inclination to forecast future inflation to be close to the currently perceived level of

inflation. In other words, backward-looking behaviors of households are more pronounced in Korea. It suggests that households in Korea may update inflation information less frequently; i.e., information rigidity in Korea is higher.<sup>19</sup>

As there are noticeable gaps between the perceptions and expectations of inflation in the advanced economies, the impact of perceptions on expectations in those economies should be weaker than in Korea. This inference can be verified using equation (2). The results are presented in Table 5 below. Specifically, in the

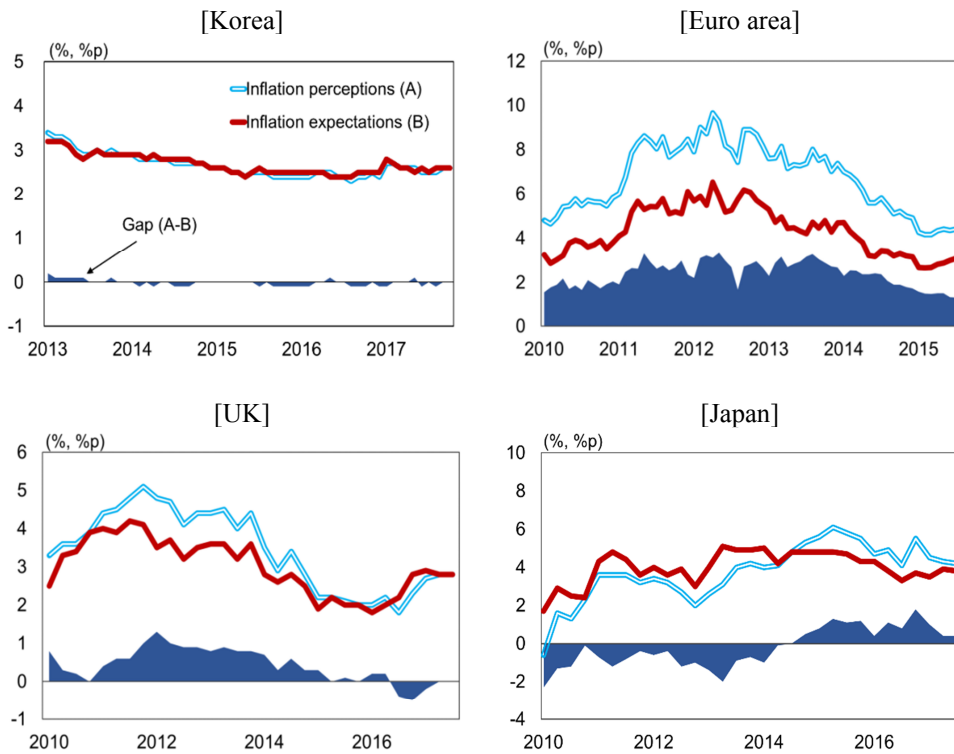


FIGURE 9. CROSS-CORRELATION BETWEEN INFLATION EXPECTATIONS AND ACTUAL INFLATION

Source: National statistical office and the central bank of each country; Arioli *et al.* (2016).

TABLE 5—ESTIMATED IMPACT ON INFLATION EXPECTATIONS IN ADVANCED ECONOMIES

	Inflation perceptions ( $\pi_t^p$ )	Inflation over the past year ( $\pi_{t-12}^{aver}$ )
Euro area	0.62***	1.05**
UK	0.88***	0.34***
Japan	0.54***	0.22
Korea	0.79***	0.18

Note: 1) *Estimated impact* refers to the coefficient  $\beta$  in equation (2):  $\Delta\pi_t^e = \alpha + \beta\Delta\pi_t^p + \gamma GAP_{t-1} + \epsilon_t$ . 2) The sample period is from January 2010 to July 2015 for the Euro area, from Q1 2010 to Q3 2017 for the UK and Japan, and from January 2013 to October 2017 for Korea. 3) \*\*\* and \*\* denote statistical significance at the 1% and 5% level, respectively.

<sup>19</sup>Because it is beyond the purpose of this paper to elucidate the reason why information rigidity appears to be stronger in Korea, we leave this issue for future studies.

Euro area, inflation over the past one year influences expectations more heavily than inflation perceptions, while in Japan, the impacts of the two indicators are estimated to be similar.

### C. An Additional Commonality

The results of the cross-country analysis above can be considered as provisional evidence that inflation expectations of households are formed universally in a backward-looking manner. We find an additional commonality in the relationship between actual inflation and inflation expectations. As presented in Figure 10, inflation perceptions always outstrip actual inflation in all of the economies, thereby causing systematic forecast errors in inflation expectations.<sup>20</sup> We ascribe this phenomenon to households' cognitive biases operating when perceiving inflation. Experimental studies have shown that general consumers are more susceptible to price increases, especially larger increases, than decreases and hence remember them more clearly. Jungermann *et al.* (2007) find that the participants in an experiment tend to perceive price increases more accurately compared to price

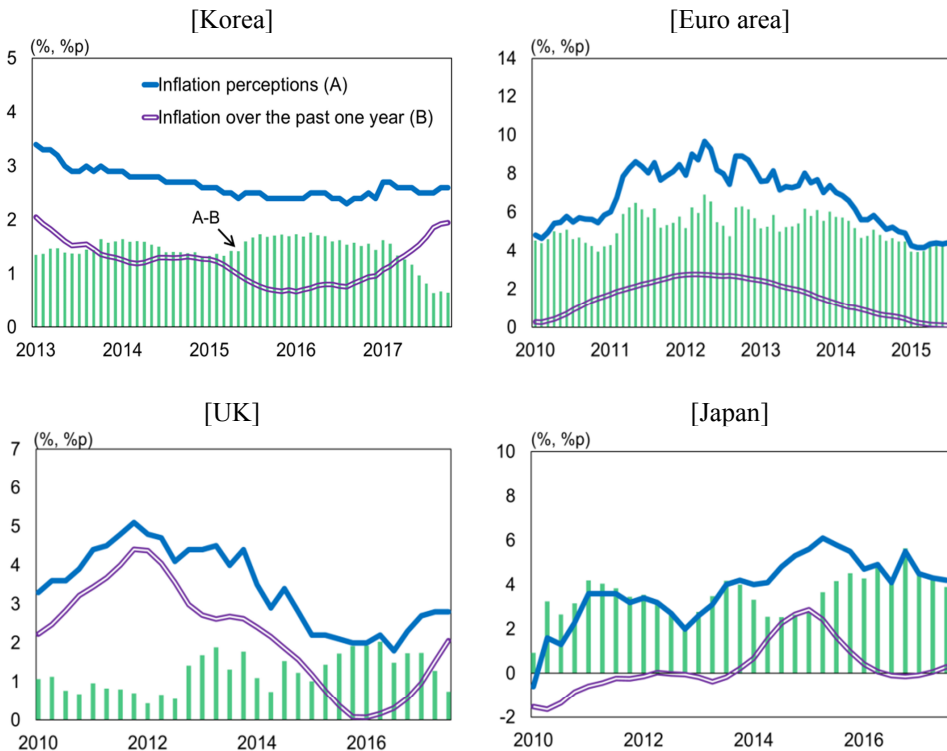


FIGURE 10. INFLATION PERCEPTIONS AND ACTUAL INFLATION

Source: National statistical office and the central bank of each country; Arioli *et al.* (2016).

<sup>20</sup>The estimation results presented in Appendix B verify systematic forecast errors in inflation expectations in Korea and in the advanced economies.



decreases.<sup>21</sup> Bruine de Bruin *et al.* (2011) also present an experimental result showing that larger price changes are more strongly remembered.<sup>22</sup> As a consequence, this asymmetric perception of price changes acts as a factor that widens the gap between inflation expectations and actual inflation in an *inflation-declining* era. Arithmetically, inflation declines if consumption items whose prices decrease or increase by less than before multiplies. In such a situation, economic agents become less sensitive to price changes, consequently, the gap between inflation perceptions and actual inflation would become larger.

Additionally, the tendency of selecting the central intervals on the Consumer Survey question with regard to inflation perceptions may act as a marginal factor causing inflation perceptions to remain higher than actual inflation when the latter is below 2%. On the survey questionnaires for Korea and the UK, respondents are asked to choose one among 1%p-wide intervals from 0% to 6%. With this type of questionnaire design, respondents are more likely to choose intervals in the range of 2% to 4%, leading inflation perceptions to exceed actual inflation.

## IV. Scope of Information for Forming Inflation Expectations

### A. Case of Korea

The rational expectation theory assumes that economic agents utilize all information available at the time they form expectations for the future.<sup>23</sup> Applying this to inflation expectation formation, economic agents should employ not only price information but also information on macroeconomic variables and economic policies. However, contrary to this hypothesis, previous studies have verified that economic agents mainly use their personal memories of specific price changes and a narrow range of economic information.<sup>24</sup> Below, we estimate the scope of information presumably utilized when forming inflation expectations in Korea *à la* Forsells and Kenny (2002) for the period from January 2013 to October 2017.<sup>25</sup> The estimation model is specified as follows.

<sup>21</sup>Research in behavioral economics suggests the loss aversion tendency maintained by Kahneman and Tversky (1979) as the reason for economic agents reacting more sensitively to increases in prices than decreases (Brachinger, 2008; Jungermann *et al.*, 2007).

<sup>22</sup>These findings apparently contradict the estimation result of equation (1) presented in the previous section, showing that inflation expectations react more sensitively to actual inflation in the *inflation-declining* period. To reiterate our hypothetical explanation proposed in the same section regarding that puzzle, households might expect low inflation to persist longer into the future without active updating of inflation information as inflation remained subdued for too long a period.

<sup>23</sup>Hall (1978) maintains that inflation expectations can be said to be formed rationally only when economic agents understand the structure of the economy accurately and hold all information necessary for generating optimal forecasts in a statistical sense.

<sup>24</sup>This is supported by results of analyses using various methodologies such as surveys (Benford and Driver, 2008; Rowe, 2016) and experiments (Georganas *et al.*, 2014, *inter alia*). Unlike these findings, Forsells and Kenny (2002) show that the level of rationality is estimated to be intermediate in the expectation formation process in the Euro area.

<sup>25</sup>Lee (2012), using data from February 2002 to October 2010 and the methodology of Forsells and Kenny (2002), indicated earlier that inflation expectations are not formed in a rational manner. However, the data, as noted earlier, were compiled by asking inflation forecasts while providing past CPI inflation rates.

$$(3) \quad \pi_t - \pi_t^e = \delta + \lambda \Omega_t + \varepsilon_t$$

where  $\pi_t$  is the average inflation over the coming twelve months after time  $t$  and  $\pi_t^e$  denotes inflation expectations formed at time  $t$ . The dependent variable,  $\pi_t - \pi_t^e$ , is the forecast error.  $\Omega_t$  is the information set employed by economic agents at the time of expectation formation, which includes the indicators of price, business and financial condition. Specifically, price indicators are the CPI inflation rate and the growth rates of nominal wages and house prices. Business indicators include the cyclical components of the composite leading index and composite coincident index, and the growth rate of industrial production. Financial indicators are the yields of 91-day CDs (Certificates of Deposit) and three-year government bonds, and exchange rates. Following Forsells and Kenny (2002), we conduct univariate regressions including each indicator as a unique explanatory variable to prevent multi-collinearity problem.

If the regression coefficient  $\lambda$  is statistically significant, it implies that the information content of a specific indicator remains in the forecast error. In other words, the indicator is not sufficiently taken into account in the process of forming inflation expectations. To interpret the estimation results presented in Table 6, all the price indicators are utilized when forming inflation expectations while most of the business indicators and financial indicators are not. Based on this result, it can be concluded that inflation expectations in Korea are formed using fairly limited information, such as inflation, wages, and housing prices, not with all available information.<sup>26</sup>

TABLE 6—ESTIMATION RESULT OF THE INFLATION EXPECTATION RATIONALITY TEST

	$\Omega_t$	$\lambda$	p-value
	CPI inflation rate	-0.114	0.623
Price Indicators	Nominal wage growth rate	0.045	0.173
	House prices growth rate	0.037	0.228
	Composite leading index	-0.112	0.637
Business Indicators	Coincident composite index	0.622	0.029**
	Industrial production growth rate	0.102	0.014**
Financial Indicators	91-day CD rate	-0.459	0.009***
	Three-year government bond yields	-0.377	0.019**
	Exchange rate	0.003	0.009***

Note: 1) The Newey-West HAC estimator is used to generate the variance-covariance matrix of the residuals. 2) *Growth rate* means year-on-year change. 3) *Business indices* specifically refers to its cyclical components, not the level. 4) \*\*\* and \*\* denote statistical significance at the 1% and 5% level, respectively.

<sup>26</sup>Among the business indicators, the  $\lambda$  of composite leading index proves to be insignificant. However, considering the coefficients of the other two business indicators are significant, it is questionable that households allow for composite leading index in practice when forming inflation expectations..

## B. Case of Foreign Countries: A Survey of the Literature

Research findings accumulated in advanced countries have also substantiated that only a limited range of information is considered when forming inflation expectations. This section summarizes the main findings from those studies, instead of performing the same econometric analysis applied to Korea in the previous subsection. Table 7 presents the studies and the associated analysis methodology.

Among those studies, Georganas *et al.* (2014) show in a US-based experiment that price inflation for items with high purchasing frequency influences inflation perceptions strongly. Cavallo *et al.* (2017) present an experimental result showing that the prices of goods sold in supermarkets exert greater effects on inflation expectations than CPI inflation. Kamada *et al.* (2015) also ascertain that the impact of food and energy prices on inflation expectations is greater than CPI inflation in Japan. Coibion and Gorodnichenko (2015) estimate that more than 50% of the gap between the expectations of experts and general consumers can be explained by fluctuations in crude oil prices in the US from 2009 to 2011.

Additionally, Rowe (2016) found using a survey method that most households report that their inflation perceptions are determined mainly by the price inflation of the items with high purchase frequency such as food and drinks, household utilities, clothing and footwear, fuel and housing, among others, as indicated in Figure 11. Strikingly, this survey result is in fairly good agreement with the results of the data analysis presented in Section II, which showed inflation perceptions in Korea are closely correlated with the price inflation of the consumption items which account for a high proportion of household expenditures or which are frequently bought.

TABLE 7—RESEARCH ON THE FORMATION OF INFLATION PERCEPTIONS AND EXPECTATIONS IN ADVANCED COUNTRIES

Country	Research	Research method
US	Cavallo <i>et al.</i> (2017)	Experiment
	Georganas <i>et al.</i> (2014)	Experiment
	Souleles (2004)	Regression analysis
	Vlasenko and Cunningham (2015)	Creating a new price index and regression analysis (Granger causality)
Germany	Jungermann <i>et al.</i> (2007)	Experiment
UK	Rowe (2016)	Household survey
Switzerland	Huber (2011)	Experiment
Sweden	Jonung (1981)	Household survey and regression analysis
Australia	Kumar <i>et al.</i> (2015)	Company survey
Japan	Kamada <i>et al.</i> (2015)	Regression analysis

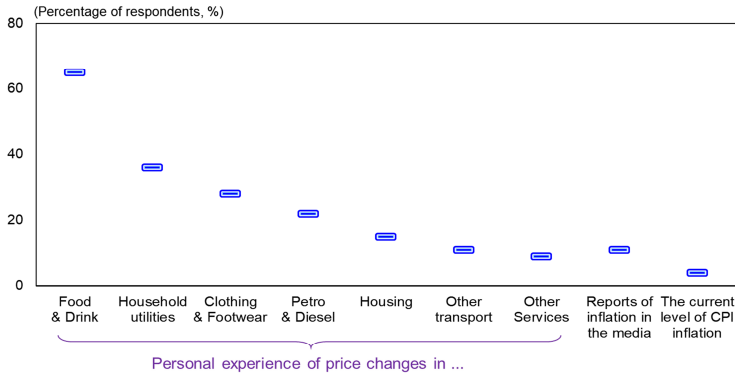


FIGURE 11. MOST IMPORTANT FACTORS REPORTED AS DETERMINING INFLATION PERCEPTIONS IN UK

Note: Respondents were allowed to choose up to four factors in the survey.

Source: Rowe (2016).

## V. Summary and Policy Implications

The inflation expectations of households in Korea are determined mainly by subjective inflation perceptions and historical inflation, that is, in a backward-looking manner. In particular, considering the fact that inflation expectations are nearly identical to inflation perceptions while hovering above actual inflation, inflation perceptions are inferred to be more influential in expectation formation process than actual inflation. In the related research in Korea, the high level of comovement between inflation expectations and actual inflation has been proposed as an empirical basis for backward-looking expectation formation. According to our analysis, the observed close correlation between inflation expectations and actual inflation arises from the fact that inflation perceptions strongly affecting inflation expectations move in tandem with the actual inflation trend. In turn, the strong correlation between inflation perceptions and the inflation trend originates from the fact that households perceive inflation fluctuations mainly utilizing the price information of consumption items that contribute substantially to changes in actual inflation.

Turning to the scope of information used for forming inflation expectations, inflation expectations are estimated to be formed with fairly bounded information rather than with all available information at the time of expectation formation. In particular, two categories of information are predominant: first, the price information of consumption items such as fuel, clothing, rent that are more frequently purchased and that have a larger share of household consumption expenditures, and second, price indicators such as CPI, wages and house prices.

From the results of the cross-country analysis of this paper and existing research findings, we derive two commonalities in terms of expectation formation. First, inflation expectations are formed in a backward-looking manner in general with only limited information. Second, inflation perceptions and expectations continue to outstrip actual inflation mainly due to asymmetric price perceptions. On the other hand, there exist several differences between Korea and the advanced

economies compared in the analysis. While inflation perceptions and expectations are nearly equal in Korea, there is an appreciable time-varying gap between the two indicators in the advanced economies. Furthermore, the impact of inflation perceptions on expectations is estimated to be not as predominant as it is in Korea. One possible explanation for these differences is that the propensity of households in Korea to forecast the current level of inflation to persist into the future, *i.e.*, the backward-looking nature of expectation formation, is more pronounced than in the advanced economies.

Considering the analysis results of this paper overall, stabilizing actual inflation through monetary policy implementation appears to be the most effective means for anchoring inflation expectations. Put differently, the scope for central banks to affect inflation expectations with measures other than monetary policy is narrower. The reason is that inflation expectations are estimated to be determined mainly by the price changes of a few consumption items such as rent, clothing, petroleum and by past inflation trends. Overseas central banks which have emphasized the importance of anchoring inflation expectations fail to devise any additional stabilization measures. However, strengthening communication on the topic inflation stabilization and the monetary policy stance may help to enhance the stability of inflation expectations.<sup>27</sup> In particular, if inflation expectations diverge excessively from actual inflation while showing a highly volatile path, it may be necessary for central banks to communicate its intention to stabilize inflation to the public aggressively by, for instance, publicizing its inflation target more frequently.

Furthermore, conducting this study, we have realized that it is necessary to study to what extent *inflation expectations affect actual inflation in practice* using a variety of methods, such as surveys and quantitative analyses. The common knowledge that *inflation expectations affect actual inflation through price setting and wage negotiations* is based mainly on the theoretical Phillips Curve relationship, the cornerstone of the New Keynesian theory rather than on empirical evidence. Future studies on that issue will hopefully prompt discussions leading to re-examination of the importance of inflation expectations from the viewpoint of monetary policy.

<sup>27</sup> Ehrmann *et al.* (2017) argue that communication from central banks regarding inflation stabilization can contribute to anchoring inflation expectations, as inflation expectations respond sensitively to news about inflation. In addition, Fritzer and Rumler (2015) suggest that forecast errors in inflation expectations of respondents who are aware of inflation targets are smaller than those of the other respondents.

## APPENDIX

## A. Consumer Survey Questions for Inflation Perceptions and Expectations

• By how much do you think CPI inflation has changed *over the past year?*

- a. decreased
- b. 0% to less than 1%
- c. 1% to less than 2%
- d. 2% to less than 3%
- e. 3% to less than 4%
- f. 4% to less than 5%
- g. 5% to less than 6%
- h. 6% or more
- i. don't know

• By how much do you expect the CPI to change *over the coming year?*

- a. decreased
- b. 0% to less than 1%
- c. 1% to less than 2%
- d. 2% to less than 3%
- e. 3% to less than 4%
- f. 4% to less than 5%
- g. 5% to less than 6%
- h. 6% or more
- i. don't know

## B. Systematical Forecasting Error of Inflation Expectations

The following regression model proposed by Mincer and Zarnowitz (1969) is estimated to examine whether the gap between inflation expectations and future inflation for the next year occurs regularly and continuously.

$$\pi_{t+12}^{aver} = \alpha + \beta\pi_t^e + \varepsilon_t$$

In this equation,  $\pi_{t+12}^{aver}$  denotes the annual average inflation for one year after time  $t$ , which is the time of expectation formation.  $\pi_t^e$  denotes expectations for average inflation over the next year, *i.e.*, inflation expectations in the Consumer Survey. The null hypothesis is ' $\alpha = 0$  and  $\beta = 1$ ', which means that the bias of inflation expectations ( $\pi_t^e$ ) is not systematic. As shown in Table A1, the null hypothesis is rejected in Korea and in the major advanced countries, which implies the forecasting error in inflation expectations occurs systematically.

TABLE A1—FORECASTING ERROR OF INFLATION EXPECTATIONS

	Korea	US	Euro area	UK	Japan
$\alpha$	-1.53***	-1.00*	-2.07***	-1.88**	-2.03**
$\beta$	0.91***	0.86***	2.32***	1.31***	0.63***
F statistics	40.16***	20.62***	25.35***	26.36***	10.96***

Note: 1) If the null hypothesis ' $\alpha = 0$  and  $\beta = 1$ ' is rejected, forecasting error in inflation expectations occurs systematically. 2) The sample periods are from January 2013 to August 2016 for Korea, from January 2010 to September 2017 for the US, and from Q1 2010 to Q3 2017 for the others economies. 3) \*\*\*, \*\*, and \* denote the 1%, 5%, and 10% significance level, respectively.

## REFERENCES

- Arioli, R., C. Bates, H. Dieden, I. Duca, R. Friz, C. Gayer, G. Kenny, A. Meyler and I. Pavlova.** 2016. "EU Consumers' Quantitative Inflation Perceptions and Expectations: An Evaluation." European Commission Discussion Paper, No. 038.
- Bank of England.** 2010-2016. <https://www.bankofengland.co.uk/statistics>.
- Bank of Japan.** 2016. "Comprehensive Assessment: Developments in Economic Activity and Prices as well as Policy Effects since the Introduction of Quantitative and Qualitative Monetary Easing (QQE): The Background."
- Bank of Korea.** 2013-2017. Economic Statistics System (<https://ecos.bok.or.kr>).
- Benford, J. and R. Driver.** 2008. "Public Attitudes to Inflation and Interest Rates." *Bank of England Quarterly Bulletin* 2008 Q2: 148-156.
- Blanchflower, D. G. and C. MacCoille.** 2009. "The Formation of Inflation Expectations: An Empirical Analysis for the UK." NBER Working Paper No. 15388.
- Brachinger, H. W.** 2008. "A New Index of Perceived Inflation: Assumptions, Method, and Application to Germany." *Journal of Economic Psychology* 29(4): 433-457.
- Bruin de Bruin, W., W. van der Klaauw and G. Topa.** 2011. "Expectations of Inflation: The Biasing Effect of Thoughts about Specific Prices." *Journal of Economic Psychology* 32(5): 834-845.
- Cabinet Office.** 2010-2016. <http://www.esri.cao.go.jp>.
- Cavallo, A., G. Cruces and R. Perez-Truglia.** 2017. "Inflation Expectations, Learning, and Supermarket Prices: Evidence from Survey Experiments." *American Economic Journal: Macroeconomics* 9(3): 1-35.
- Choi Byung Jae.** 2012. "Major Characteristics and Implications of General Public Inflation Expectation Indicators." *The Bank of Korea Monthly Bulletin* August 2012 (in Korean).
- Coibion, O. and Y. Gorodnichenko.** 2015. "Is the Phillips Curve Alive and Well after All? Inflation Expectations and the Missing Disinflation." *American Economic Journal: Macroeconomics* 7(1): 197-232.
- Detmeister, A., D. Lebow and E. Peneva.** 2016. "Inflation Perceptions and Inflation Expectations." *FEDS Notes*. Washington: Board of Governors of the Federal Reserve System.
- Easaw, J., R. Golinelli and M. Malgarini.** 2013. "What Determines Households Inflation Expectations? Theory and Evidence from a Household Survey." *European Economic Review* 61: 1-13.
- Ehrmann, M., D. Pfajfar and E. Santoro.** 2017. "Consumers' Attitudes and Their Inflation Expectations." *International Journal of Central Banking* 13(1): 225-259.
- Ehrmann, M.** 2015. "Targeting Inflation from Below: How Do Inflation Expectations Behave?" *International Journal of Central Banking* 11(4): 213-249.
- Forsells, M. and G. Kenny.** 2002. "The Rationality of Consumers' Inflation Expectations: Survey-based Evidence for the Euro Area." European Central Bank Working Paper No. 163.
- Fritzer, F. and F. Rumler.** 2015. "Determinants of Inflation Perceptions and Expectations: An Empirical Analysis for Austria." *National Bank of the Republic of Austria Monetary Policy and The Economy* 2015 Q1: 11-26.
- Georganas, S., P. J. Healy and N. Li.** 2014. "Frequency Bias in Consumers' Perceptions of Inflation: An Experimental Study." *European Economic Review* 67: 144-158.
- Hall, R. E.** 1978. "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence." *Journal of Political Economy* 86(6): 971-987.
- Huber, O. W.** 2011. "Frequency of price increases and perceived inflation. An Experimental Investigation." *Journal of Economic Psychology* 32(5): 651-661.
- Jonung, L.** 1981. "Perceived and Expected Rates of Inflation in Sweden." *American Economic Review* 71(5): 961-968.
- Jungermann, H., H. W. Brachinger, J. Belting, K. Grinberg and E. Zacharias.** 2007. "The

- Euro Changeover and the Factors Influencing Perceived Inflation.” *Journal of Consumer Policy* 30(4): 405-419.
- Kahneman, D and A. Tversky.** 1979. “Prospect Theory: An Analysis of Decision under Risk.” *Econometrica* 47(2): 263-291.
- Kamada, K., J. Nakajima and S. Nishiguchi.** 2015. “Are Household Inflation Expectations Anchored in Japan?” Bank of Japan Working Paper Series No. 15-E-8.
- Kumar, S., H. Afrouzi, O. Coibion and Y. Gorodnichenko.** 2015. “Inflation Targeting Does Not Anchor Inflation Expectations: Evidence from Firms in New Zealand.” NBER Working Paper No. 21814.
- Lee Hangyu and Choi Jinho.** 2015. “Korean Households’ Inflation Expectations and Information Rigidity.” *KDI Journal of Economic Policy* 37(supplementary): 33-63 (*in Korean*).
- Lee Jung-ik.** 2012. “Characteristics of Inflation Expectations in Korea.” *BOK Economic Review* No.2012-1 (*in Korean*).
- Mincer, J. and V. Zarnowitz.** 1969. “The Evaluation of Economic Forecasts.” 3-46 in *Economic Forecasts and Expectations: Analysis of Forecasting Behavior and Performance*, edited by Jacob A. Mincer, National Bureau of Economic Research.
- Office for National Statistics.** 2010-2016. <https://www.ons.gov.uk>.
- Rowe, J.** 2016. “How are Households’ Inflation Expectations Formed?” *Bank of England Quarterly Bulletin* 2016 Q2: 82-86.
- Souleles, N. S.** 2004. “Expectations, Heterogeneous Forecast Errors, and Consumption: Micro Evidence from the Michigan Consumer Sentiment Surveys.” *Journal of Money, Credit, and Banking* 36(1): 39-72.
- Statistics Bureau.** 2010-2016. <http://www.stat.go.jp>.
- Statistics Korea.** 2013-2017. Korea Statistical Information System (<https://kosis.kr>).
- Vlasenko, P. and S. R. Cunningham.** 2015. “Capturing the Inflation that People Experience: The Everyday Price Index vs. the Consumer Price Index.” American Institute for Economic Research Working Paper No. 004.

## LITERATURE IN KOREAN

- 이정익.** 2012. 「우리나라 기대인플레이션의 특징」. 『BOK 경제리뷰』 No. 2012-1.
- 이한규·최진호.** 2015. 「우리나라 일반인 인플레이션 기대 형성 행태 분석」. 『한국개발연구』 제37권 특별호 (통권 제127호).
- 최병재.** 2012. 「일반인 기대인플레이션 지표의 주요 특징과 시사점」. 『조사통계월보』 2012년 8월호. 한국은행.
- 통계청.** 2013-2017. KOSIS 국가통계포털(<https://kosis.kr>).
- 한국은행.** 2013-2017. 경제통계시스템(<https://ecos.bok.or.kr>).