

SPECIAL ANALYSIS

Inflation expectations by gender, age and education

Households' inflation expectations for the coming year are published monthly in the NIER's Economic Tendency Survey. The following looks at households' forecasting performance, both as a whole and for various sub-groups. The analysis reveals that all of the groups studied have systematically overestimated future inflation. Households' forecast accuracy is also only moderate: a strategy where the forecast on each occasion is equal to the inflation target is associated with greater forecast accuracy during the period than any of the groups analysed.

HOUSEHOLDS' INFLATION EXPECTATIONS IN THE ECONOMIC TENDENCY SURVEY

Each month the NIER publishes its Economic Tendency Survey, which presents the results of Sweden's most extensive survey of how households and firms view both their own finances and the Swedish economy as a whole. One of the questions asked each month of those selected to represent each household is what inflation will be in 12 months' time.⁷⁴ The following analysis looks at households' forecasting performance, both as a whole and broken down by gender, age and education.⁷⁵

The analysis spans inflation expectations collected for the period from December 2001 to June 2013 (see Diagrams 145–148).^{76, 77} Besides households' expectations, two very simple

⁷⁴ More precisely, the question is formulated as follows: "By how many per cent do you think prices will rise/fall (in other words, what the rate of inflation/deflation will be) over the next 12 months?"

⁷⁵ The responses to all questions in the consumer side of the Economic Tendency Survey are broken down into a number of different groups. The data can be downloaded from statistik.konj.se.

⁷⁶ Households' inflation expectations began to be measured in the late 1970s, but there are a number of advantages of restricting the analysis to the period from December 2001 to June 2013. First, all of the observations then date from the current monetary policy regime with an inflation target, which can be considered firmly established by December 2001. This means that there are no structural breaks where the formation of expectations varies with the monetary policy regime. Second, the method used to collect households' inflation expectations has changed somewhat over time. GfK Sweden AB took over the collection of data from Statistics Sweden in 2001, and the first observation based on GfK Sweden AB's data was in December 2001. (Since October 2009, the survey has been conducted by CMA Research AB. As CMA Research AB uses similar methods to GfK Sweden AB, the NIER does not believe that the change of research firm in itself has impacted on the time series.) For more detail on the methodology, see the "User Guide to the Economic Tendency Survey", which can be downloaded from www.konj.se.

⁷⁷ The series for actual CPI inflation (see Diagram 145) consisted until December 2004 of the rate calculated by Statistics Sweden using the "old method", i.e. the change in prices for an unchanged basket of goods. This series can be downloaded from www.statistikdatabasen.scb.se. From January 2005 to June 2014, CPI inflation is the annual percentage change in the CPI.

Diagram 145 Inflation and inflation expectations, one year horizon, for men and women

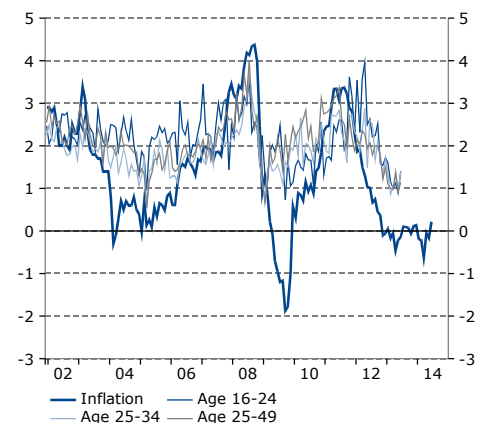
Per cent, monthly values



Sources: Statistics Sweden and NIER.

Diagram 146 Inflation and inflation expectations, one year horizon, for different age groups

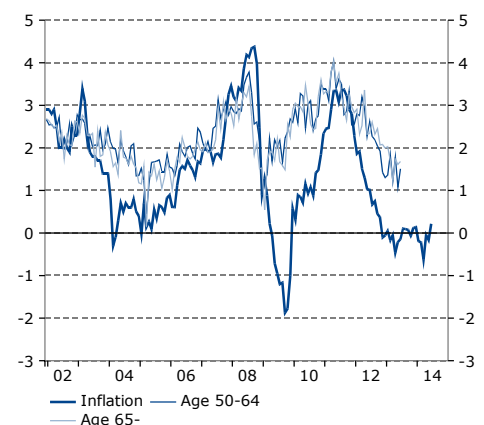
Per cent, monthly values



Sources: Statistics Sweden and NIER.

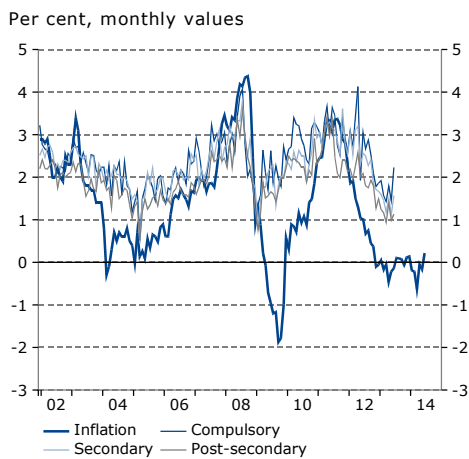
Diagram 147 Inflation and inflation expectations, one year horizon, for different age groups

Per cent, monthly values



Sources: Statistics Sweden and NIER.

Diagram 148 Inflation and inflation expectations, one year horizon, for different educational levels



Sources: Statistics Sweden and NIER.

alternative forecasting methods are evaluated. The first is a naive forecast, where the inflation forecast on each occasion is the same as the current rate of inflation. The second is where inflation in a year's time is assumed to be in line with the inflation target, or 2 per cent. The reason for including these alternative forecasts is to provide a benchmark for assessing how good households' expectations are.

ALL GROUPS HAVE OVERESTIMATED INFLATION

Two aspects of forecasting performance have been examined. The first is whether expectations are biased, i.e. whether there is any systematic over/underestimation. This is done by studying average forecast error, or mean error.⁷⁸ Table 19 shows that the forecasts from all groups/methods have a negative mean error. This means that all the forecasts are associated with overestimation of inflation. Four sub-groups have a mean error below -1 : women, the 50–64 age group, those with compulsory education, and those with further education. In all of these groups, the overestimation of inflation is statistically significant (at the 5 per cent level).⁷⁹ Only in the case of the naive forecast, where the mean error is closest to zero, can the null hypothesis of no bias not be rejected.

MODERATE FORECAST ACCURACY

The other aspect of forecasting performance studied is forecast accuracy. This has been assessed using root mean square error (RMSE).⁸⁰ The lower the RMSE of a forecast, the higher the forecast accuracy.

Table 19 shows that the group with the highest accuracy is those with higher education, followed by the 25–34 age group and men. The difference between these three groups is marginal, however, and not statistically significant.⁸¹

⁷⁸ The forecast error $e_{t+12|t}$ is defined here as the actual value less the forecast value, i.e. $e_{t+12|t} = \pi_{t+12} - \pi_{t+12|t}$. The mean error (ME) is given by the equation $ME = (1/n) \sum_{i=0}^{n-1} e_{t+12+i|t+i}$.

⁷⁹ Statistical significance has been tested by estimating an equation for each group/method where the forecast error is explained only by a constant. The null hypothesis of unbiased forecasts can be rejected if the absolute value of the t-statistic for the constant is sufficiently high. Robust standard errors – or Newey-West standard errors – have been used in the calculations to handle the serial correlation that arises by definition in this analysis.

⁸⁰ The root mean square error is given by the equation

$$RMSE = \sqrt{(1/n) \sum_{i=0}^{n-1} (e_{t+12+i|t+i})^2}$$

⁸¹ Pairwise Diebold-Mariano test statistics cannot reject the null hypothesis of equal forecast accuracy at reasonable significance levels. See Diebold, F.X. and R.S. Mariano, "Comparing predictive accuracy", *Journal of Business and Economic Statistics* 13, 1995, pp. 253-263, for a detailed description of the test.

The lowest forecast accuracy among the groups in the Economic Tendency Survey is for those with compulsory education, followed by women, the 16–24 and 50–64 age groups, and those with further education. These groups' forecast accuracy is also significantly lower than for the group with higher education.⁸²

The highest forecast accuracy of all, however, is achieved by the method where inflation one year ahead is assumed to be in line with the inflation target.

Table 19 Mean errors and root mean square errors for household inflation expectations December 2001–February 2013

| | Mean error | RMSE |
|----------------|------------|------|
| Total | –0.90 | 1.67 |
| Women | –1.01 | 1.76 |
| Men | –0.79 | 1.60 |
| 16–24 | –0.93 | 1.76 |
| 25–34 | –0.64 | 1.58 |
| 35–49 | –0.85 | 1.65 |
| 50–64 | –1.05 | 1.76 |
| 65– | –0.99 | 1.73 |
| Compulsory | –1.13 | 1.81 |
| Secondary | –1.03 | 1.76 |
| Post-secondary | –0.70 | 1.56 |
| Naive | –0.23 | 1.98 |
| Target | –0.74 | 1.52 |

Note. "RMSE" denotes the root mean square error. "Naive" denotes a forecast based on actual inflation at the time of the forecast. "Target" denotes a forecast at all times equal to the Riksbank's target of 2 per cent.

Sources: Statistics Sweden and NIER.

THE CAUSES OF THE DIFFERENCES BETWEEN GROUPS HAVE NOT BEEN ANALYSED

The analysis above reveals statistically significant differences in forecast accuracy between the various groups. It should, however, be borne in mind that the differences between groups that emerge here may be due to factors other than those used to form these groups. If, for example, women on average have a lower level of education than men, and education is a factor that impacts on forecast accuracy, a difference observed between

⁸² Here, too, pairwise Diebold-Mariano test statistics have been used.

men and women could be due to differences in education rather than gender.⁸³ Although it might be interesting from a number of angles to know how and why expectations differ, this has not been explored further here. From a forecasting perspective, it is most interesting to know the characteristics of the groups actually reported in the Economic Tendency Survey, as these are, after all, the ones available to analysts and forecasters.⁸⁴

GENERAL SHORTCOMINGS IN HOUSEHOLDS' INFLATION EXPECTATIONS

In summary, it has been found that households' inflation expectations in the Economic Tendency Survey appear to have some shortcomings. Although those with higher education and those in the 25–34 age group seem to have both the lowest systematic error in their forecasts and the highest forecast accuracy (when it comes to the expectations in the Economic Tendency Survey analysed here), it is also the case that these groups' expectations are not unbiased, and that their forecast accuracy is lower than can be achieved using the simplistic method of assuming that the inflation target will always be met one year ahead. The fact that these forecasts have shortcomings from a forecasting perspective does not mean that they lack value when analysing the Swedish economy, but it may be useful for those using these forecasts as a basis for analysis to be aware of their characteristics.

⁸³ Research in the field indicates that there are differences in inflation forecasts due to factors such as an individual's age, gender, education and income. A number of explanations have been proposed for these differences, such as different consumption patterns in different groups, but this explanation is not universally accepted. For examples of empirical studies and further discussion in this area, see, for example, Jonung, L. (1981), "Perceived and Expected Rates of Inflation in Sweden," *American Economic Review* 71, pp. 961-968, and Bryan, M.F. and G. Venkatu, "The Curiously Different Inflation Perspectives of Men and Women", *Federal Reserve Bank of Cleveland Economic Commentary*, November 2001.

⁸⁴ Nor does the present analysis consider the issue of the implications for the economy as a whole (e.g. when it comes to wage formation or household consumption) that these documented characteristics of households' inflation expectations might have.