

SPECIAL ANALYSIS

The Riksbank has Systematically Overestimated Inflation

This analysis examines the Riksbank's forecasts of CPI inflation and underlying inflation (UND1X/CPIX and CPIF) for systematic errors at 1- to 24-month horizons, and finds that the central bank's forecasts of both CPI inflation and underlying inflation contain systematic errors. The Riksbank's overestimation of inflation has contributed to overly tight monetary policy with higher unemployment and lower inflation than would have been the case if, on average, its inflation forecasts had been on the mark.

THE RIKSBANK'S INFLATION FORECAST ERRORS

The Riksbank has been criticised in the public debate recently for the low precision of its inflation forecasts.¹⁹ In the government's forecast evaluation, the Riksbank had the worst forecast precision for CPI inflation of the institutions examined in the period 2007–2012.²⁰ This finding is supported by a study from the Riksbank itself.²¹ Diagram 34 and Diagram 35 present actual CPI inflation and underlying inflation together with the central bank's forecasts 1 to 24 months ahead.²²

At least as important as forecast errors being small (high precision) is that they are not systematic, in other words the mean error over time should be zero (no bias).²³ The government's forecast evaluation finds that the Riksbank's full-year forecasts for CPI inflation are very close to significantly overestimating

¹⁹ See, for example, IMF Country Report No. 12/155, June 2012; Munkhammar, V., "Riksbankens inflationsprognoser näst sämst" (Riksbank's inflation forecasts second worst), *Dagens industri*, 18 April 2013; and *Dagens industri's* Shadow Executive Board in Munkhammar, V., "Riksbanken på efterkälken" (Riksbank off the pace), *Dagens industri*, 15 April 2013; all of which are critical of the Riksbank's inflation forecasts.

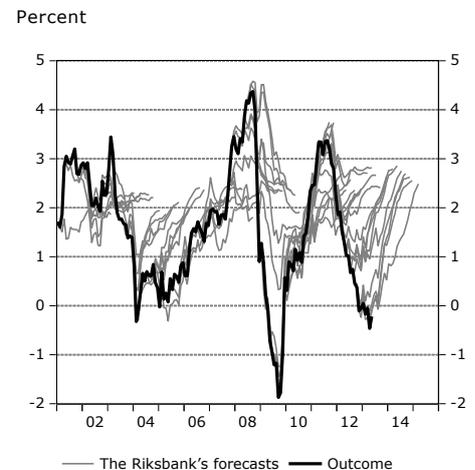
²⁰ Measured as mean squared error, adjusted for differences in the forecast horizon. See the 2013 spring fiscal policy bill (prop. 2012/13:100), pp. 83-85.

²¹ Andersson, M. and S. Palmqvist, "The Riksbank's forecasts hold up well", *Economic Commentaries* 2013:3, Sveriges Riksbank.

²² The present analysis takes account of the revision of Statistics Sweden's methodology for calculating inflation in January 2005. This does, however, affect the forecast errors in forecasts made in 2003 and much of 2004 for 2005. Statistics Sweden has since revised inflation ex post for April to July 2008 and for May 2009 to April 2010 due to errors detected, but this has not been taken into account in this analysis for technical reasons. This simplification may have slightly affected the mean forecast error measured in the short term (1–11 months) but not the evaluation over longer horizons (over 11 months). The overall results are therefore unaffected.

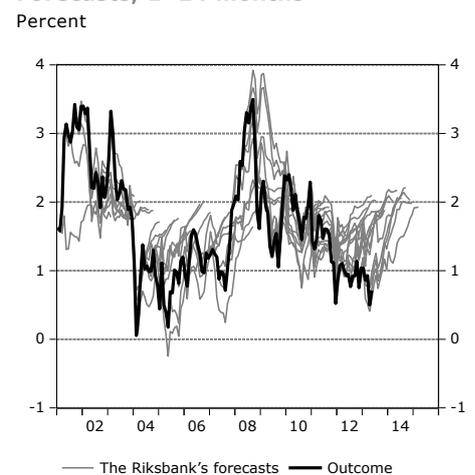
²³ Any systematic errors will probably have a greater impact on monetary policy than low forecast precision.

Diagram 34 CPI Inflation, Actual Values and the Riksbank's Forecasts, 1–24 months



Sources: The Riksbank, Statistics Sweden and NIER.

Diagram 35 Underlying Inflation, Actual Values and the Riksbank's Forecasts, 1–24 months



Note: In the graph, actuals refer to UND1X/CPIX until February 2008 and to CPIF thereafter. Hence, forecasts made June 2006–March/April 2008 are not exactly comparable to actual values. However, all calculations presented in the text are based on comparing UND1X/CPIX forecasts to UND1X/CPIX actual values.

Sources: The Riksbank, Statistics Sweden and NIER.

the actual outcome.²⁴ The annual forecast evaluations by the Riksbank, the government and the NIER look at full-year forecasts for the current year and following year. The present analysis examines instead the Riksbank's *monthly* inflation forecasts for *systematic errors* and with a *fixed* horizon of 1–24 months. Forecast errors at the 24-month horizon are particularly serious, because they have a greater impact on monetary policy. As forecast errors can be due to exceptional circumstances, such as the financial crisis, comparisons are made with the NIER's inflation forecasts. If other forecasters perform better in terms of bias, this provides an indication that the Riksbank could have produced forecasts that, on average, were nearer the mark.

Forecasts for CPI, UND1X, CPIX and CPIF inflation have been evaluated for the period from March 2001 to March/April 2013.²⁵ The last three of these are measures of underlying inflation and are referred to as such in this analysis. The official inflation target is annual CPI inflation of 2 per cent. For the Riksbank to avoid “chasing its own tail” when changing the repo rate, underlying inflation is also important in the central bank's deliberations, which is why this measure of inflation is also included in the present analysis.²⁶ The latest data for actual inflation used in this analysis are for May 2013. At the end of the evaluation period, observations are excluded starting from the 24-month horizon. The final observations at the one-month horizon, for example, are the Riksbank and NIER forecasts of April and March 2013 respectively. In autumn 2005 the Riksbank stopped basing the forecasts in its main scenario (which is evaluated here) on an assumption of a constant repo rate.²⁷ It

²⁴ At a 5 per cent significance level. Only SEB, Handelsbanken and HUI Research have a higher bias. The NIER has the second-lowest bias in its annual forecasts of CPI inflation, and the government has the lowest of all.

²⁵ This corresponds to 59 forecasts from the Riksbank and 49 from the NIER. The UND1X/CPIX forecasts are from the period from March 2001 to February (Riksbank) and June (NIER) 2008, corresponding to 28 forecasts from the Riksbank and 30 from the NIER. With the CPIF, the evaluation covers forecasts from April (Riksbank) and August (NIER) 2008 to March (NIER) and April (Riksbank) 2013, corresponding to 31 forecasts from the Riksbank and 19 from the NIER. Underlying inflation is a chained series of these two measures (UND1X/CPIX and CPIF) and therefore contains data from 59 forecasting rounds from the Riksbank and 49 from the NIER.

The NIER's March forecasts include monthly inflation forecasts only for the current and following year. It is not therefore possible to evaluate the NIER's bias at the 23- and 24-month horizons for these forecasts. The same applies to the NIER's June 2011 forecast, for which only 1- to 19-month horizons have been evaluated.

²⁶ As household mortgage interest expenditure is included in the CPI (but not in the CPIF), an interest rate cut will lead to lower CPI inflation in the short term. See, for example, Heikensten, L., “The Riksbank's inflation target – clarifications and evaluation”, *Economic Review* 1999:1, Sveriges Riksbank.

²⁷ The path for the repo rate was now instead to reflect market expectations, as measured by implied forward interest rates. Since February 2007, the Riksbank has used its own endogenous forecast for the repo rate.

will therefore be of interest to look at the period from 2005 to 2013 separately.²⁸

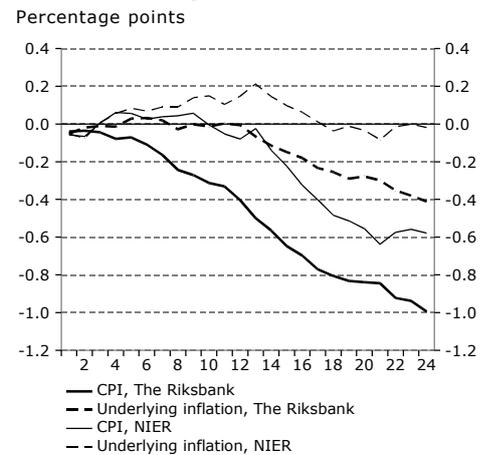
THE RIKSBANK'S CPI FORECASTS ARE ON AVERAGE AROUND 1 PERCENTAGE POINT TOO HIGH AT THE 24-MONTH HORIZON

Forecast errors²⁹ for CPI inflation and underlying inflation have been calculated for both periods and for each forecast horizon (1 to 24 months).³⁰ The mean forecast errors are presented in Diagram 36 and Diagram 37.³¹ For the full evaluation period from 2001 to 2013, the Riksbank's mean forecast error is, with few exceptions, negative at all horizons for both CPI inflation and underlying inflation. In other words, the central bank has overestimated inflation. At the 24-month horizon, the Riksbank has, on average, overestimated CPI inflation by around 1 percentage point and underlying inflation by around 0.4 percentage points over the full evaluation period. By way of comparison, the NIER has overestimated CPI inflation by an average of 0.6 percentage points at the 24-month horizon over the same period, while the mean forecast error in its forecasts of underlying inflation at the same horizon over that period is close to zero.

For the shorter evaluation period from 2005 to 2013, the Riksbank's results are largely unchanged, while the NIER overestimates CPI inflation by an average of around 0.3 percentage points at the 24-month horizon and *underestimates* underlying inflation by an average of around 0.2 percentage points at the same horizon.

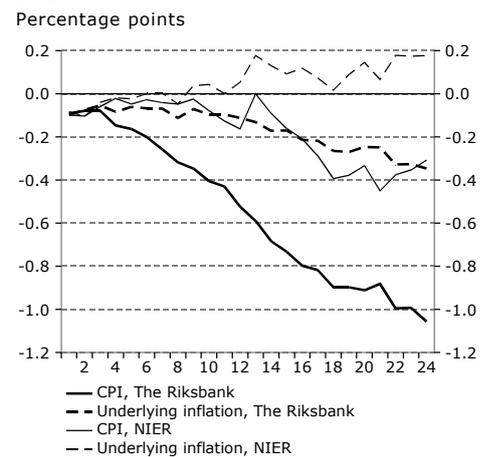
To determine whether these average forecast errors are large or small, they can be compared with the standard errors of the forecast errors. This has been done, and p-values have been calculated.³² The Riksbank's forecasts of CPI inflation and un-

Diagram 36 Mean Forecast Errors for Forecast Horizons 1–24 Months, March 2001–March/April 2013



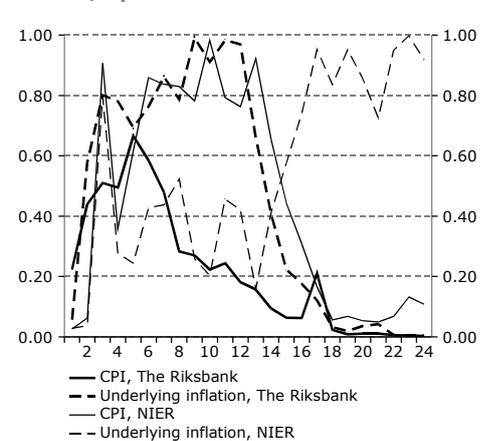
Sources: The Riksbank, Statistics Sweden, NIER.

Diagram 37 Mean Forecast Errors for Forecast Horizons 1–24 Months, August/October 2005–March/April 2013



Sources: The Riksbank, Statistics Sweden, NIER.

Diagram 38 p-values for Forecast Horizons 1–24 Months, March 2001–March/April 2013



Sources: The Riksbank, Statistics Sweden, NIER.

²⁸ The evaluation of this period starts with the NIER's forecast published in August 2005 and the Riksbank's forecast published in October 2005, giving 31 observations for the NIER and 41 for the Riksbank.

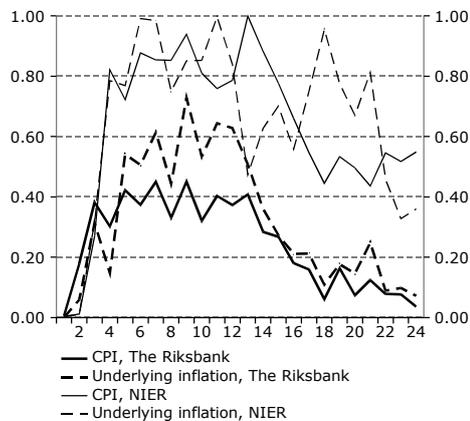
²⁹ Forecast errors are defined as outcome less forecast, $y_{t+h} - \hat{y}_{(t+h|t)}$, where y_{t+h} is actual inflation at time $t+h$ and $\hat{y}_{(t+h|t)}$ is the forecast of the same made h months earlier.

³⁰ The Riksbank used modal value forecasts prior to 2007, and then expected value forecasts (symmetrical confidence intervals). Skewness-adjusted forecasts prior to 2007 would probably have altered the Riksbank's results somewhat (due to skewed distributions around the point forecasts).

³¹ The mean and variance of forecast errors have been estimated using a regression model with only a constant. The parameter estimates for the constant are then equal to the mean forecast error.

³² The p-value is the probability of a value at least as extreme as the one observed, assuming that the true mean forecast error is zero. Newey-West standard errors have been used to calculate these p-values. The number of lags, L , is based on Newey and West's own rule (in combination with a Bartlett kernel function), $L=n^{0.25}$, rounded to the nearest integer.

Diagram 39 p-values for Forecast Horizons 1–24 Months, August/October 2005–March/April 2013



Sources: The Riksbank, Statistics Sweden and NIER.

derlying inflation in the period from March 2001 to April 2013 have a significant³³ bias (overestimation) at forecast horizons of 18 months or more, see Diagram 38. At the 24-month horizon, the p-values are below 0.01, which means that the bank's overestimation of inflation is highly significant on a two-year view. The equivalent p-value for the NIER's CPI forecasts is 0.11, and the p-value for the NIER's forecasts of underlying inflation is close to 1, which means that there are no signs of bias.

Looking instead at the p-values for the period from August/October 2005 to March/April 2013, a similar picture emerges, see Diagram 39. Due to the smaller number of observations, both standard errors and p-values are higher. Nevertheless, the mean forecast error for the Riksbank's forecasts of CPI inflation is significantly different from zero (inflation overestimated) at the 24-month horizon. There are also indications of overestimation in the Riksbank's forecasts for underlying inflation (p-value around 0.07) during this period. However, there is no statistically significant bias in the NIER's inflation forecasts over this period.

WHY HAS THE RIKSBANK SYSTEMATICALLY OVERESTIMATED INFLATION?

There are a number of possible reasons why the Riksbank has overestimated inflation. One, highlighted by the Riksbank itself as one of the most important, is that the bank has systematically overestimated import prices and underestimated productivity growth, so overestimating inflationary pressures.³⁴ Systematic overestimation of inflationary pressures has also been cited as a possible explanation by others.³⁵ One possibility mentioned by the IMF is that the Riksbank may have systematically overestimated potential unemployment. Another is that the repo rate's influence on the economy may have waned in recent times, for example through a weaker pass-through from the repo rate to lending rates.

³³ At a 5 per cent significance level.

³⁴ See Söderström, U. and A. Vredin, "Inflation, unemployment and monetary policy", *Economic Commentaries* 2013:1, Sveriges Riksbank. This has also been cited as an explanation in Jansson, P., "Riksbanken har ingen hemlig agenda" (The Riksbank has no hidden agenda), DN debatt, 9 May 2011, www.dn.se. This reasoning is supported by Assarsson, B., "Riksbank forecasts of import prices and inflation", *Economic Review* 2007:3, Sveriges Riksbank.

³⁵ See IMF Country Report No. 12/155, June 2012, and Zettergren, G., "Naturligt hög arbetslöshet? – om sambandet mellan politik och jämviktsarbetslöshet" (Naturally high unemployment? On the relationship between policy and equilibrium unemployment), report in the *Sysselsättning och tillväxt i Sverige och Europa* (Employment and Growth in Sweden and Europe) series, Global utmaning, 2011.

It is, of course, possible that the main reason – as argued by the Riksbank – is that the bank has been surprised by strong productivity and low imported inflation, and that, given the information available at each forecast date, the bank has made the best possible ex ante assessment.

WHAT HAVE BEEN THE CONSEQUENCES OF THE RIKSBANK'S INFLATION FORECAST PERFORMANCE?

The problem with these overly high inflation forecasts is that they have motivated a higher repo rate and repo rate path.³⁶ The Riksbank has overestimated inflation and so pursued overly tight monetary policy. With more accurate assessments of inflationary pressures, monetary policy would have been more expansionary, with the result that forecasts at the 24-month horizon would have held. The bias in the Riksbank's inflation forecasts has contributed to a higher repo rate, and so higher unemployment, than would have been the case if, on average, its inflation forecasts had been on the mark.³⁷

As far back as 2006, two external experts appointed by the Swedish parliament to evaluate the country's monetary policy expressed concern that inflation had undershot the inflation target for long periods.³⁸ They concluded that this could be a sign that the analytical and forecasting models used by the Riksbank tend to overestimate inflation, and that there was therefore a risk of further low inflation going forward.

CLOSING REMARKS

Both the government and the Riksbank itself have previously shown that the Riksbank has made large forecast errors relative to other forecasters in its assessments of future inflation. Besides weak forecast precision, the present analysis reveals that the central bank's inflation forecasts have been systematically too high. The NIER believes that the large forecast errors, combined with significant overestimation of both CPI inflation and underlying inflation, have influenced monetary policy, resulting in too low inflation and too high unemployment.

³⁶ For example, in its monetary policy update of April 2013, the Riksbank revised down its forecast of CPI inflation and underlying inflation in 2014 by 0.7 and 0.4 percentage points respectively relative to the February 2013 monetary policy report. The bank's forecast for the repo rate in 2014 was lowered by 0.5 percentage points at the same time.

³⁷ This is supported by Svensson, L.E.O., "The possible employment cost of average inflation below a credible target", manuscript, 2012, www.larseosvensson.net.

³⁸ Giavazzi, F. and F.S. Mishkin, *En utvärdering av den svenska penningpolitiken 1995–2005* (An evaluation of Swedish monetary policy between 1995 and 2005), Report from the Riksdag 2006/07:RFR1, Sveriges Riksdag, 2006.