

## ■ The repo rate path and monetary policy expectations according to implied forward rates

Sweden is a small, open economy and is thus affected to a great extent by what happens in the surrounding world. One important variable in this context is the exchange rate, as it affects prices of both imported and exported goods. The exchange rate thus affects both aggregate demand and inflation. Developments in the exchange rate are linked to the difference between interest rates in Sweden and those in other countries. The forecasting work therefore includes an assessment not only of developments in Swedish interest rates, but also those in foreign interest rates.

### Difficult to measure monetary policy expectations

Using certain assumptions, expectations of future interest rates and monetary policy can be calculated on the basis of prices of derivatives in the money market. The forecasts for interest rates in other countries take into account information from these implied forward rates as well as from surveys and model analyses.

Calculating monetary policy expectations on the basis of implied forward rates is difficult. This is partly because forward rates also include risk premiums, which means that the measure does not solely reflect expectations of the future policy rate.

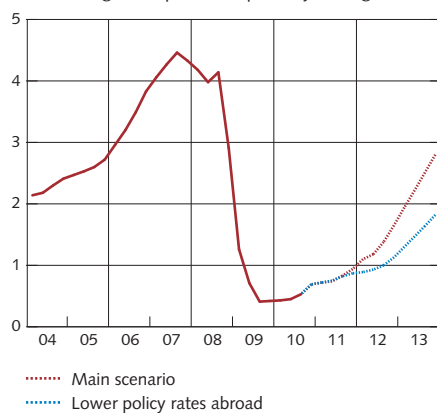
Another means of measuring monetary policy expectations is to use surveys. These have the advantage that they give estimates of market agents' expectations of the future interest rate without having to take forward premiums into account. In times of financial turmoil, forward premiums often vary substantially. Expectations based on surveys may therefore be a more robust measure of monetary policy expectations during such periods. However, surveys are not without their problems, either. For instance, the statistical sample is often fairly small and the surveys are not carried out very often.<sup>21</sup>

Forward rates and surveys thus have different advantages and disadvantages as measures of monetary policy expectations and one should therefore not rely solely on one of these measures. The currently large difference between forward rates and survey responses also illustrates the uncertainty and the difficulties in measuring monetary policy expectations at present (see Figure 1:8).

At the moment, short and long market rates as well as implied forward rates are very low in many of the countries around us. In the Eurozone, an initial increase of the policy rate is not expected for at least one year. The policy rates in the United Kingdom and the United States are also expected to remain low for a long time to come. One possible interpretation of this is that market participants believe that the probability of a "double dip" abroad is high (see the alternative scenario with a "double dip" abroad in Chapter 2) and therefore have a much more gloomy view of GDP growth and inflation than is described in the international outlook in this Monetary Policy Report. Another possibility is that the crisis in certain countries has subdued the future growth potential

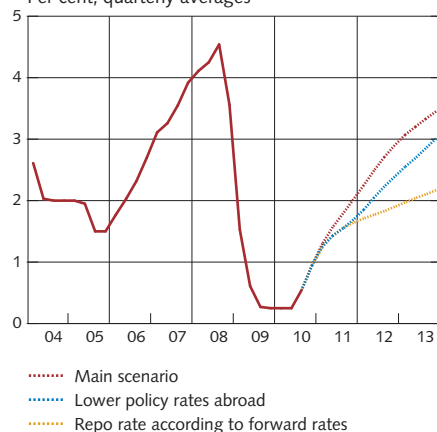
<sup>21</sup> See also J. Alsterlind and H. Dillén, "Monetary policy expectations and forward premia", *Economic Review*, 2005:2, Sveriges Riksbank.

**Figure B11. Policy rates abroad**  
TCW-weighted, per cent, quarterly averages



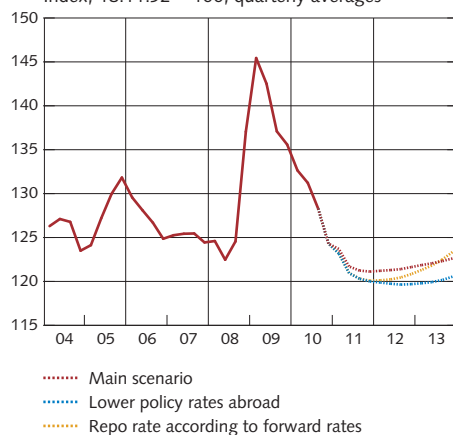
Note. Broken lines represent the Riksbank's forecast.  
Source: The respective central banks

**Figure B12. Repo rate**  
Per cent, quarterly averages



Note. Broken lines represent the Riksbank's forecast.  
Source: The Riksbank

**Figure B13. TCW-weighted exchange rate**  
Index, 18.11.92 = 100, quarterly averages



Note. Broken lines represent the Riksbank's forecast.  
Source: The Riksbank

or led to an increase in precautionary saving, which in turn reduces the economies' so-called neutral equilibrium interest rate. It may also be the case that the market believes in a combination of a "double dip" and a lower neutral equilibrium rate. A further possibility is that the measures to facilitate the supply of credit implemented by central banks around the world have pushed down interest rates for longer maturities more than is justified by lower expectations of future policy rates. In this context it may also play a role that there has recently been considerable demand for safe assets such as government bonds in countries with relatively sound public finances (what is known as a flight to quality). If this is what lies behind the low long-term interest rates, implied forward rates may provide a picture of expectations of future interest rates that is more difficult to interpret.

The Riksbank's forecast for policy rates abroad is currently higher than implied forward rates at longer horizons, as shown in Figure B11, where the blue line shows the forward rates. There are several reasons for this. First and foremost, the probability of a "double dip" in the Riksbank's main scenario is low. It is also difficult, on the basis of current information, to draw the conclusion that the neutral equilibrium interest rate has become much lower. More data is required before it is possible to comment on this with any great certainty. A further reason is that normal historical patterns for interest rates (for instance, Taylor rules of various types) indicate that interest rates should be much higher than is indicated by the implied forward rates. Finally, other measures of monetary policy expectations, such as surveys, point to higher interest rates. In these comparisons, the implied forward rates appear to be exceptionally low. It is assumed in the main scenario that the implied forward rates in Sweden and abroad will gradually adjust to the Riksbank's forecast.

To summarize, it is difficult at present to assess developments in interest rates abroad and several different scenarios appear reasonable. We show below an example where policy rates are assumed to develop in line with implied forward rates in Sweden and abroad. The effects on the Swedish economy are illustrated the Riksbank's general equilibrium model Ramses.<sup>22</sup>

### An example using a general equilibrium model

How are monetary policy in Sweden and economic developments affected by interest rates in other countries being lower than has been assumed in the main scenario? This is illustrated with an example where interest rates abroad develop in accordance with the implied forward rates as they were at the end of September.<sup>23</sup> These are shown in Table B2. The forecasts in the main scenario are given in brackets. During the forecast period

<sup>22</sup> For a description of Ramses see L. Christiano, M. Trabandt and K. Walentin, "Introducing Financial Frictions and Unemployment into a Small Open Economy Model", Working Paper no. 214, 2007, Sveriges Riksbank.

<sup>23</sup> A conceptual problem with the analysis is that it is not possible for the model to contain any difference between market interest rate expectations and the interest rate expectations of the agents in the model. This is a problem not just for general equilibrium models like Ramses, but also applies to various types of statistical models, where expectations are not explicitly shown at all. This problem does not apply to the forecast in the main scenario in the same way, as it is not a pure model forecast. The Riksbank is currently working on developing methods that will take this into account in a consistent way in economic models.

2011–2013 forward rates abroad are on average around 0.4 percentage points lower than the forecast in the main scenario. To isolate the effects of lower interest rates abroad, GDP and inflation abroad are assumed to develop in line with the Riksbank's main scenario.

**Table B2. Example with lower policy rates abroad**  
Annual percentage change unless otherwise specified

	2009	2010	2011	2012	2013
Policy rates abroad, per cent	0.7	0.5 (0.5)	0.8 (0.8)	1.0 (1.3)	1.6 (2.4)
Repo rate, per cent	0.7	0.5 (0.5)	1.5 (1.7)	2.1 (2.6)	2.8 (3.3)
TCW-weighted exchange rate, Index, 18.11.92 = 100	140.2	129.1(129.1)	121.1(121.9)	119.7(121.4)	120.1(122.2)
CPIF	1.9	2.0 (2.0)	1.0 (1.3)	1.1 (1.5)	1.7 (1.9)
CPI	-0.3	1.2 (1.2)	1.3 (1.7)	1.6 (2.2)	2.4 (2.6)
Hours gap, per cent	-2.2	-1.5 (-1.5)	-0.6 (-0.6)	-0.2 (-0.1)	0.0 (0.2)
Unemployment, per cent	8.3	8.4 (8.4)	7.6 (7.6)	7.2 (7.2)	6.9 (6.8)
GDP, calendar-adjusted	-5.1	4.6 (4.6)	3.8 (3.9)	2.9 (2.9)	2.4 (2.4)

Note. Main scenario's forecast in brackets. TCW-weighted foreign interest rates.

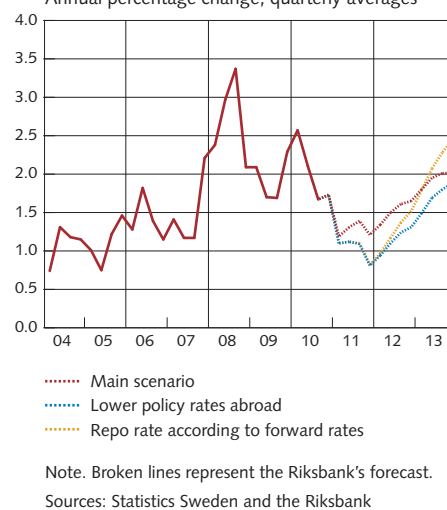
Sources: National sources, Statistics Sweden and the Riksbank

Interest rates abroad affect the Swedish economy in the model through what is known as an interest rate parity condition. More specifically, interest rate parity entails the differences between the Swedish interest rate and interest rates abroad corresponding to changes in the exchange rate. If the interest rates abroad are lower, the exchange rate is strengthened in the short term and then weakens gradually in the long term in line with the interest rate differences. But during the whole period with a lower interest rate abroad, the level of the exchange rate will be stronger than otherwise. This means that the expected return on interest-bearing assets will be the same in Sweden as it is abroad. In other words, the expected rate of depreciation over, say, five years, will roughly correspond to the interest rate difference between a Swedish five-year interest rate and a foreign five-year interest rate.

However, the stronger exchange rate has effects on the Swedish economy, so that the interest rate in Sweden is also affected; exactly how it is affected depends on the monetary policy reaction function in the model. Despite the fact that the interest rate abroad according to forward rates does not begin to deviate from the forecast in the main scenario until the fourth quarter of 2011, the Swedish economy is affected right from the first quarter of 2011. This is because households and companies in the model predict the developments in the interest rate abroad and therefore react to future changes now. The repo rate is therefore lower as early as in 2011 (see the blue line in Figure B12).<sup>24</sup>

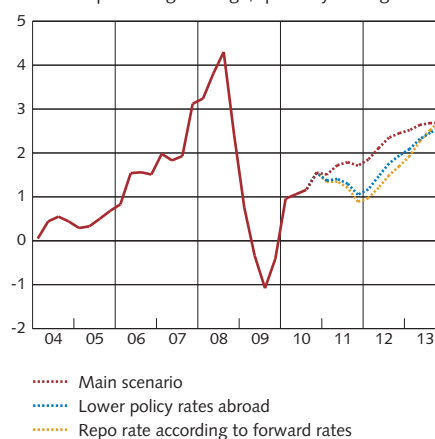
As explained above, the positive interest rate difference which gradually arises between the repo rate and the interest rate abroad leads to a strengthening of the krona (see the blue line in Figure B13). Imported goods thus become cheaper. Inflation, which is a weighted average

**Figure B14. CPIF**  
Annual percentage change, quarterly averages



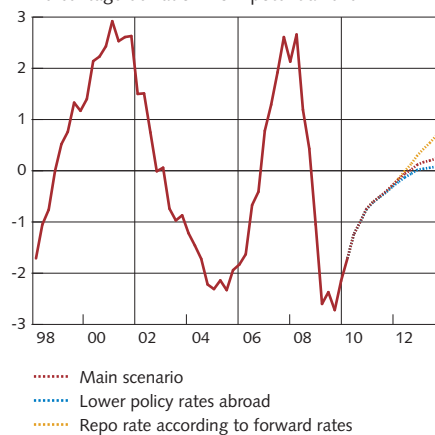
Note. Broken lines represent the Riksbank's forecast.  
Sources: Statistics Sweden and the Riksbank

**Figure B15. CPI**  
Annual percentage change, quarterly averages



Note. Broken lines represent the Riksbank's forecast.  
Sources: Statistics Sweden and the Riksbank

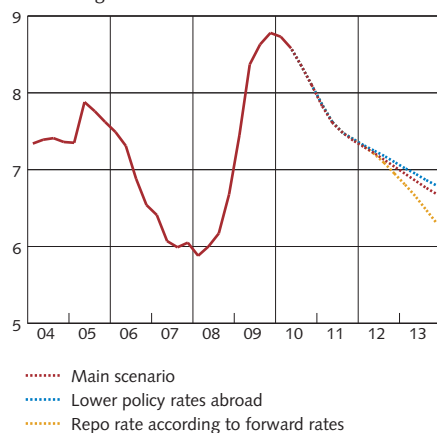
**Figure B16. Hours gap**  
Percentage deviation from potential level



Note. Broken lines represent the Riksbank's forecast.  
Sources: Statistics Sweden and the Riksbank

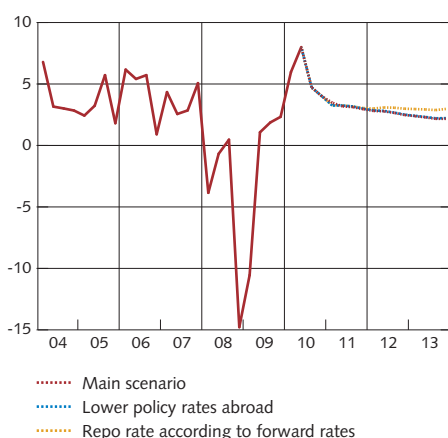
<sup>24</sup> This is a consequence of the assumption of so-called rational expectations. Whether or not this assumption is a good description of reality is a matter for discussion.

**Figure B17. Unemployment**  
Percentage of labour force



Note. Broken lines represent the Riksbank's forecast.  
Sources: Statistics Sweden and the Riksbank

**Figure B18. GDP**  
Quarterly changes in per cent calculated in annualised terms, seasonally-adjusted data



Note. Broken lines represent the Riksbank's forecast.  
Sources: Statistics Sweden and the Riksbank

between the prices of imported goods and the prices of domestic goods, is thus lower. In quantitative terms both CPIF and CPI inflation are around 0.3 percentage points lower than in the main scenario during the forecast period (see Table B2 and the blue line in Figures B14 and B15).

The lower price pressure causes a more expansionary monetary policy. The repo rate is therefore raised at a slower pace throughout the forecast period. It is on average around 0.4 percentage points lower than in the main scenario (see Table B2 and the blue line in Figure B12). However, monetary policy is not able to fully counteract the slowdown in inflation. The more expansionary monetary policy pushes up demand in the economy, but this is partly counteracted by the stronger exchange rate, which means that Swedish exports become more expensive. The hours gap, unemployment and GDP growth are therefore more or less unchanged, compared with the main scenario (see the blue line in Figures B16, B17 and B18).

Short and long rates and implied forward rates are not only low in many countries abroad; they are also low in Sweden. The yellow line in Figure B12 shows forward rates in Sweden at the end of September. On average, the implied forward rates are around 0.7 percentage points below the repo rate in the Riksbank's main scenario (see Table B3).

**Table B3. Example with repo rate according to market expectations**  
Annual percentage change unless otherwise specified

	2009	2010	2011	2012	2013
Policy rates abroad, per cent	0.7	0.5 (0.5)	0.8 (0.8)	1.0 (1.3)	1.6 (2.4)
Repo rate, per cent	0.7	0.5 (0.5)	1.5 (1.7)	1.8 (2.6)	2.1 (3.3)
TCW-weighted exchange rate, Index, 18.11.92 = 100	140.2	129.1(129.1)	121.1(121.9)	120.4(121.4)	122.2(122.2)
CPIF	1.9	2.0 (2.0)	1.0 (1.3)	1.3 (1.5)	2.1 (1.9)
CPI	-0.3	1.2 (1.2)	1.2 (1.7)	1.3 (2.2)	2.4 (2.6)
Hours gap, per cent	-2.2	-1.5 (-1.5)	-0.6 (-0.6)	-0.1 (-0.1)	0.5 (0.2)
Unemployment, per cent	8.3	8.4 (8.4)	7.6 (7.6)	7.1 (7.2)	6.6 (6.8)
GDP, calendar-adjusted	-5.1	4.6 (4.6)	3.8 (3.9)	3.1 (2.9)	3.0 (2.4)

Note. Main scenario's forecast in brackets. TCW-weighted foreign interest rates.

Sources: National sources, Statistics Sweden and the Riksbank

Swedish forward rates are also below the repo rate implied by the model's monetary policy reaction function when interest rates abroad develop in line with forward rates, see the yellow line compared with the blue line in Figure B12. It may therefore be interesting to also illustrate the effects in an example in which both the repo rate and the interest rates abroad follow forward rates. The yellow line in Figures B12–B18 illustrates this example. The difference between the yellow and blue lines thus illustrates the effects, according to the model, of a more expansionary monetary policy in Sweden.

A more expansionary monetary policy stimulates demand. Compared with the example "lower policy rates abroad" (the blue line), the lower repo rate contributes to an increase in household consumption and corporate investments. The increased demand means that production will

grow more quickly and push up the demand for labour. The hours gap in this example is almost one per cent above its normal level at the end of the forecast period (see Figure B16) and unemployment is lower (see Figure B17).

The increased demand for labour pushes up wages, which increases production costs. Companies will pass on the higher costs to the consumers and CPIF inflation will therefore be higher than in the example “lower policy rates abroad” (see Figure B14). At the end of the forecast period CPIF inflation is around 2.5 per cent. The lower repo rate reduces households’ mortgage rates, which holds down CPI inflation. CPI inflation will then be slightly lower than in the example “lower policy rates abroad” (see Figure B15). The exchange rate becomes weaker in the long run in this example, which is linked to the inflation rate in Sweden being higher than those abroad (see Figure B13).

### Summary

This example has illustrated the effects of lower policy rates in Sweden and abroad. If policy rates abroad were to develop in line with implied forward rates, this would justify a lower repo rate path and a stronger krona than in the main scenario, but the development in the real economy would be roughly the same. However, if the Swedish policy rate were also to develop in line with forward rates, both resource utilisation and inflation would be too high at the end of the forecast period.

It is worth pointing out that the results from the example are relatively uncertain. The interest rate parity condition has relatively limited support in empirical research. Moreover, models with rational expectations like Ramses cannot formally explain deviations from market expectations, and one must therefore interpret the results with caution. Model calculations of this type are a valuable support in forecasting and policy work, but they always need to be supplemented with expert assessments.