

## The path of the krona and inflation

**In the main scenario it is assumed that the krona, measured in TCW terms, will strengthen by just below 4 per cent in the next two years. This box presents and discusses different estimates of the effects on inflation of a weaker krona development than that assumed in the main scenario, namely that the krona, instead of strengthening, will remain at present levels. Swedish inflation can be expected to increase by between 0.2 and 0.5 percentage points, depending on how persistent this alternative development of the exchange rate is expected to be and on the conduct of monetary policy.**

What are the consequences for the inflation rate in Sweden of a strengthening or weakening of the krona? This is a question which arises from time to time given that the Swedish krona is a freely floating currency and that it, at times, can fluctuate sharply in a short time. By way of example, it is worth mentioning that, during 2005, the value of the krona weakened by around 6 per cent in relation to a TCW-weighted basket of foreign currencies (see Figure 6 in the main text).

Assessments of the future path of the krona are made in the course of producing the Riksbank's inflation forecast. The risk assessment also takes into consideration the likely effects on the inflation forecast of other exchange rate developments than those anticipated in the main scenario. To assess the effects that an alternative development of the krona exchange rate would have on inflation, it is necessary to take a position on how persistent this development is likely to be and the underlying reasons. The persistence of the change in the exchange rate is important because exporters and importers and other companies which have reason to let the krona exchange rate affect their prices are normally inclined to even out their price changes over time. Thus movements in

the krona exchange rate which are considered to be temporary should have minor effects on inflation.<sup>2</sup>

In order to assess the effects on inflation of changes in the exchange rate, the underlying causes of the movements in the krona exchange rate must be taken into account. Is a weakening of the krona, for example, associated with a more general change in the appraisal of the future economic outlook? Often, it is asked what would happen with the rate of inflation if the krona changed "all else equal" i.e. the change in the value of the krona is seen as a more isolated occurrence. However, this conceptual experiment is not without complications, since exchange rate movements normally are not independent of all other factors that affect inflation. The answer to the question regarding the effects of the krona exchange rate changes will thus depend on the other disturbances that the economy is exposed to at the same time and on the disturbances that underlie the exchange rate movement.

This box discusses a type of disturbance, or shock, to the exchange rate which comes very close to the conceptual experiment of "all else equal". An unexpected change in investors' demand for assets denominated in different currencies is assumed to take place. This is a type of disturbance which has probably been of considerable practical importance, since exchange rates often change without any obvious changes in other "fundamental" variables. The box presents model-based estimates of the effects on inflation of hypothetical krona exchange rate movements attributable to changes in portfolio managers' demand for krona assets under different assumptions regarding the conduct of monetary policy. The latter illustrates the difficulty of maintaining "all else equal". The monetary policy reaction to a change in the exchange rate is decisive for the impact on inflation. The

<sup>2</sup> See also the box entitled "The exchange rate and imported inflation" in Inflation Report 2004:2.

estimates of pass-through to the price level and inflation in the short and long term are discussed.

#### *A change in the demand for krona assets*

When the demand for the krona falls without any other fundamental changes in the economy, the value of the krona will naturally fall. But the size and persistence of the exchange rate movement will depend on how monetary policy responds.

The demand for assets (e.g. bonds) denominated in different currencies is governed by the yield (the interest rate) from the different assets but also by expectations regarding exchange rate movements. Portfolio managers and international investors may be prepared to accept a lower interest rate on assets in kronor if the krona is expected to increase in value during the investment horizon. However, assets in different currencies are not normally regarded as perfect substitutes and accordingly, investors demand different types of premia (excess returns) for holding different assets. A sudden change in the krona exchange rate could then depend on a sudden change in the demand for krona assets, or in other words a change in the required excess return.<sup>3</sup>

All other things being equal, what will be the consequences for inflation of a weakening of the exchange rate caused by a reduction in the demand for krona assets? Figures R1–R3 (the dashed lines) present the effects of an increase in the risk premium on krona assets (i.e. reduced demand for the krona in relation to assets in other currencies) on the krona exchange rate, the level of interest rates and the price level. Table 1 shows the effects on the inflation rate. These effects have been computed with the aid of a general equilibrium model with sticky wages and prices.<sup>4</sup> In the experiment, the risk premium is assumed to increase so much that the krona is approximately 6 per cent weaker at the end of 2007 ("year 2") than it would

have been otherwise (see Figure B1). It is then assumed that the risk premium (the demand for krona assets) reverts to its normal pattern. The exchange rate forecast in the main scenario entails a strengthening of almost 6 per cent (measured by the TCW index) between the fourth quarter of 2005 and the fourth quarter of 2007 and this alternative computation therefore means a marginal weakening of the krona from its present level.

In this experiment, it should be noted that the change in the demand for krona assets gives rise to interest rate changes.<sup>5</sup> It is assumed in the model that monetary policy follows a version of the "Taylor rule", meaning that the interest rate is set taking into consideration the deviation of inflation from the inflation target and the level of resource utilisation. The Riksbank thus reacts to events in the economy, which in this scenario means that the repo rate is raised, partly because the weakening of the exchange rate gives rise to increased inflationary tendencies. It is furthermore assumed that the Riksbank will normally implement interest rate changes in many small steps rather than a few large ones ("interest-rate smoothing") with the result that the interest rate will be above the level that would otherwise have applied for a long period (see Figure B2, dashed line).

This tightening of monetary policy will help curb inflation, i.e. the increase in the price level will be very moderate (see Figure B3, dashed line). The effects on inflation are illustrated in the first two columns in Table B1. During the first year, when the krona is on average 2.6 per cent weaker than in the main scenario, inflation will be 0.1 percentage points higher. During year 2, when the krona is on average 5.6 per cent weaker, inflation will be 0.2 percentage points higher. During year 3, when the krona starts to strengthen again, inflation will also be 0.2 percentage points higher than it would have been in the case where the krona does not weaken.

<sup>3</sup> However, the sign that the premium should have is not self-evident; sometimes krona assets can be in such great demand that the interest rate can be maintained at a lower level than abroad while at other times the converse applies.

<sup>4</sup> The model used is a variant of the model presented in Adolfson, M., S. Laséen, J. Lindé and M. Villani, "Bayesian Estimation of an Open Economy DSGE Model with Incomplete Pass-Through", Sveriges Riksbank Working Paper Series No. 179, 2005, estimated on Swedish data.

<sup>5</sup> The assumption of "all else equal" means that one wishes to study the effects of an exchange rate weakening given that all agents in the economy – households, businesses and also the central bank – abide by their normal pattern of behavior.

<sup>6</sup> The real exchange rate is defined as the ratio between the foreign price level converted into Swedish kronor and the Swedish price level.

These are relatively small effects on inflation, which depend partly on the increase in the repo rate and partly on the weakening of the exchange rate not being persistent, i.e. the krona strengthens again from the beginning of 2008 (see Figure B1). Why does the exchange rate strengthen after the assumed weakening? This is not by assumption in the experiment but follows from basic economic principles present in the macro model. Above all, it depends on the long-term path of the real exchange rate (alternatively, "competitiveness") not being affected by temporary movements in risk premia. In time, therefore, the change in the price level will be matched by an equally large change in the nominal exchange rate.<sup>6</sup> Thus the pass-through of the exchange rate change to the price level will be complete in the long run. In this scenario, which ultimately only produces a slight increase in the price level, the final level of the exchange rate must be close to the initial level. The small effect on the price level is in turn due the tightening of monetary policy following the weakening of the exchange rate. The experiment thus entails a temporary weakening of the exchange rate. This then also affects the impact on inflation in the short term, i.e. during the first two years when the exchange rate weakens, given that businesses that wish to have stable price development in their customers' currency refrain from changing their prices in response to exchange rate movements that they perceive as temporary.

*A change in demand for krona assets in combination with no monetary policy reaction*

With other assumptions regarding the response of monetary policy, a larger share of the weakening of the exchange rate can be permanent, which in turn will produce other short-term effects on inflation.

This can be illustrated in a hypothetical scenario in which it assumed that the central bank refrains from reacting to increasing inflation following in the wake of a weakening

exchange rate. Note that in this hypothetical scenario the central bank is actually departing from its normal conduct, and that "all else" is not "equal" in the analysis. The effects on the exchange rate, the interest rate level and the price level respectively, are shown in the solid lines in Figures R1-R3. In this hypothetical scenario, inflation and the price level increase more than in the previous scenario. The effects on the exchange rate and inflation are shown in the third and fourth columns in Table B1. During the first year, when the currency is on average 2.6 per cent weaker than in the main scenario, inflation will be 0.1 percentage points higher. During year 2, when the currency is 5.6 per cent weaker, inflation is 0.5 percentage points higher. During years 3 and 4, when the exchange rate strengthens, inflation continues to exceed the base scenario.

Why are the effects on inflation larger and more persistent in this case than in the scenario above? The weakening of the exchange rate in this hypothetical scenario is partly permanent (see Figure B1), which gives firms reason to pass on the effects of exchange rate movements in the form of price increases directly from year 1 and year 2. And why is a larger part of the weakening of the currency permanent in this case? The same mechanisms are at play here as above, i.e. the path of the real exchange rate is not affected in the long term by the type of disturbances that in this experiment caused the change in the nominal exchange rate. However, the price level increases more than in the previous scenario, which is completely natural since the central bank in this hypothetical scenario does not act to counteract the rise in inflation. As there is a long-term increase in the price level, the nominal exchange rate must finally be at a level that is weaker than the original rate.

*Conclusions on the krona exchange rate's impact on inflation*

These two experiments show that there is no fixed relation between a given weakening of

<sup>6</sup> The real exchange rate is defined as the ratio between the foreign price level converted into Swedish kronor and the Swedish price level.

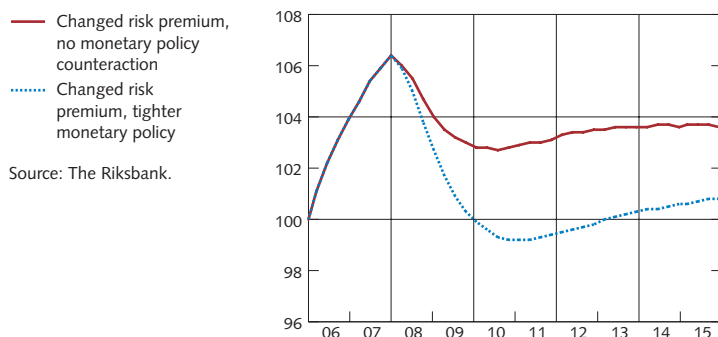
**Table B1. Exchange rate depreciation and inflation effects (UND1X).  
Deviation from baseline scenario. Per cent (exchange rate) and percentage points (inflation)**

Year	Case 1: Changed risk premium, Tighter monetary policy		Case 2: Changed risk premium, No monetary policy counteraction	
	Exchange rate	Inflation	Exchange rate	Inflation
1	2.6	0.1	2.6	0.1
2	5.6	0.2	5.6	0.5
3	4.4	0.2	5.0	0.7
4	0.7	0.1	3.1	0.6

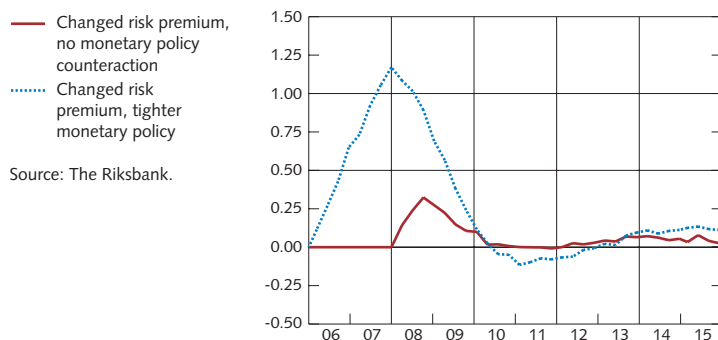
Note: Positive values in the exchange rate column mean a weaker currency than in the baseline scenario.

Source: The Riksbank.

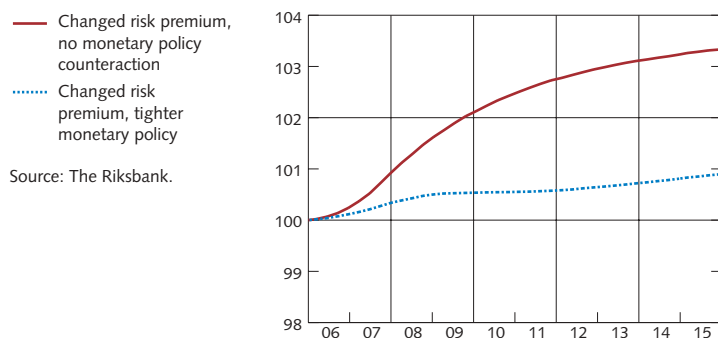
**Figure B1. The path of the exchange rate.  
Index, deviation from baseline scenario**



**Figure B2. The development of the repo rate.  
Percentage points, deviation from baseline scenario**



**Figure B3. The development of the price level.  
Index, deviation from baseline scenario**



the exchange rate and inflation. Monetary policy is of crucial importance for the short-term pass-through of exchange rate movements to inflation. This is not only due to the more "direct" inflation-dampening effects of increases in the repo rate but also because monetary policy determines the final level of the price level and the nominal exchange rate after disturbances to the nominal exchange rate, i.e. the extent to which the weakening of the exchange rate is permanent. In the first scenario, when the repo rate is raised to dampen the increase in inflation, the long-term rise in the price level is small and the nominal weakening of the exchange rate is temporary. The short-term pass-through to inflation is therefore also relatively low. In the second, more hypothetical scenario, where monetary policy does not react to the rise in inflation, the final increase in the price level and the exchange rate is greater, i.e. a larger share of the weakening of the exchange rate is permanent.<sup>7</sup> This also affects the pass-through to inflation in the short term.

In both experiments, the exchange rate weakens approximately 6 per cent over two years. However, the pass-through to inflation during these two years differs depending on the response of monetary policy and on how permanent the weakening of the exchange rate proves to be. The more permanent a weakening of the exchange rate is judged to be, the greater the short-term pass-through to inflation.

<sup>7</sup> In both cases, it is thus disturbances to the risk premium that cause the weakening of the exchange rate. The difference between the scenarios is that monetary policy deviates from its normal pattern of conduct (i.e. is subject to disturbances) in scenario 2. In principle, a scenario is conceivable where monetary policy disturbances alone cause the weakening of the exchange rate. In these cases, the weakening of the exchange rate persists (i.e. the exchange rate is 6 per cent below the original level in the long term as well), and the price level increases as much as the exchange rate is weakened. The short-term effects on inflation will be considerably greater, in line with the reasoning in this box.