ARTICLE – The pass-through of the krona to inflation appears to have been larger than usual

Inflation has been high both abroad and in Sweden this past year. But it is now somewhat higher in Sweden than the average in the euro area. Among the components in the CPIF, the difference is clearest in that goods prices has increased more rapidly in Sweden. There are many factors that affect the development of goods prices, such as energy prices and input goods, but an important explanation for why goods prices has increased more rapidly in Sweden than in many other countries is probably the depreciation of the krona. In addition, there are signs that the change in the exchange rate has affected consumer prices more rapidly than usual this past year, which is in line with studies indicating that cost changes have a greater pass-through to prices when inflation is high than when it is low.

Exchange rate weakening has contributed to inflation upturn

There are numerous indications that companies' pricing behaviour has changed over the past years of high inflation. For example, the correlations between producer prices and consumer prices, between energy prices and consumer prices, and between exchange rates and inflation have not followed historical patterns. Supply shocks in the aftermath of the pandemic and Russia's invasion of Ukraine coincided with high demand as society opened up and households had large savings to use for consumption. The imbalance between supply and demand allowed companies to pass on large cost increases to a greater extent than we have seen historically. A weaker krona is one of these factors. In this article, we analyse the impact of the krona on goods prices.

The exchange rate is one of many factors that influence inflation, as it affects the price of what is imported. However, it is difficult to determine exactly how large an effect variations in the exchange rate have on inflation and the pass-through also varies over times. Over the past two years, the krona has depreciated by around 15 per cent and the Riksbank assesses that this has to some extent contributed to the high inflation in Sweden during this period.[56]

Normally, variations in the exchange rate have moderate effects on inflation. In 2016, the Riksbank published results from various estimated models that showed overall

[56] In October 2023, the krona was 16 per cent weaker against the euro compared with October 2021. The corresponding depreciation in KIX terms was 13 per cent.

that a permanent 10-percent depreciation of the krona usually leads to an increase in inflation of at most around 0.5 percentage points after approximately one year.[57] In the Riksbank's macroeconomic model, MAJA, the effect of the same change in the exchange rate is 0.7, 0.3 and 0.2 percentage points respectively the first three years.[58] These estimated pass-throughs, which describe the average historical effect are small given that between 25 and 30 per cent of private consumption consists of imports.[59]

If one uses these assumptions as a base, the krona depreciation in recent years has not affected inflation to any great extent. The estimates imply that the contribution should have been at most 0.3-0.4 percentage points in early 2023. If one allows the MAJA model to explain developments in inflation in recent years, the contribution will be about the same size.[60] This is small in relation to a total inflation level that in some months amounted to around 10 per cent (see Figure 1).

Swedish goods prices rising relatively rapidly

Inflation is somewhat higher in Sweden than in the euro area and many other European countries (see Figure 27). It is goods prices in particular, which comprise just over 25 per cent of the CPIF, that have increased faster in Sweden over the past year (see Figure 46). Over the past year, the rate of increase has deviated from other countries considerably, with, on the one hand, Sweden and Norway, which deviate upwards and, on the other hand, Denmark which deviates downwards. What Sweden and Norway have in common is that both the Swedish krona and the Norwegian krona have weakened against the euro, while the Danish krone is pegged to the euro. This indicates that the exchange rate's development may have contributed to the differences. But the slower increase in goods prices in Denmark than in the euro area, despite the same exchange rate development, indicates at the same time that other factors may well be as important for goods prices.

[57] See the article "The impact of the exchange rate on inflation in *Monetary Policy Report*, December 2016, Sveriges Riksbank. Note that the estimates apply to effects on inflation. It is reasonable to expect that prices will rise more in the longer run, but there is a gradual adjustment.

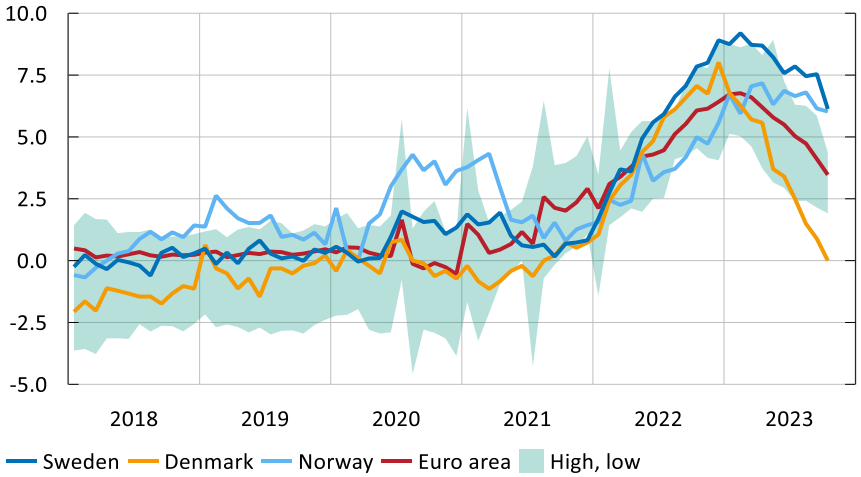
[58] This applies when the change in the exchange rate is driven by a change in the risk premium on Swedish assets. For a discussion of what has caused the krona depreciation, see the article "The krona will strengthen in the medium term" in *Monetary Policy Report*, September 2023, Sveriges Riksbank.

[59] See Table A2 in J. Hansson and J. Johansson, "Alternative measures of inflation for monetary policy analysis", Economic Review, 2007:3, Sveriges Riksbank for estimates of import content. See also the discussion in M. Lindskog and H. Lovéus (2023), "Import prices, labour costs and profits – what role have they played in inflation dynamics?" *Staff Memo*, September, Sveriges Riksbank.

[60] This refers to the contributions from changes in the exchange rate caused by risk premium disruptions in MAJA.

Figure 46. Goods prices (excl. food)

Annual percentage change



Note. The interval shows the highest and lowest rates of increase in Spain, Italy, Germany, France, the Netherlands, Belgium, Ireland, Luxembourg, Portugal, Austria and Finland.

Source: Eurostat.

The krona depreciation may have contributed more than usual to inflation recently

The question of how large a pass-through the exchange rate has had to inflation and whether this has changed has been very much in focus recently. The fact that the historically normal exchange rate pass-through is less than the import content in consumption is because many companies tend to smooth their price increases and allow profit margins to absorb some of the fluctuations in the exchange rate in the short term. The way prices change depends on what causes the change in the exchange rate and in which economic environment it occurs, and the effects on inflation can be both greater and smaller than has been the case on average.[61] There are studies indicating that the pass-through from cost changes, such as changes in the exchange rate, is greater when, for example, inflation and demand are high.[62] Besides exchange rate changes, the pass-through is also grater from changes in energy prices and other input goods in such an environment.

The krona has depreciated by around 15 per cent against the euro since the end of 2021 (see Figure 47). This is not the first time the krona has depreciated to a corresponding extent against the euro in a short time. For example, a similar depreciation occurred between 2016 and 2019. Since the beginning of 2022, goods prices in Sweden have increased by around 5 per cent more than in the euro area, but when the krona depreciated between 2016 and 2019, Swedish goods prices rose at around the same pace as those in the euro area (see Figure 47). This could be a sign that

[61] See V. Corbo and P. Di Casola (2020), "Drivers of consumer prices and exchange rates in small open economies", *Working Paper* No 387, Sveriges Riksbank

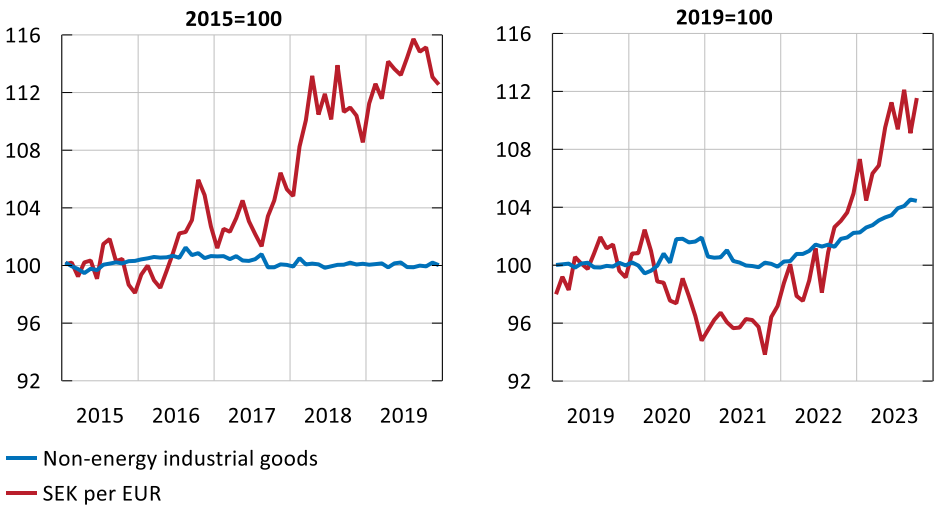
[62] See, for example, the fact box "Pass-through of the exchange rate when inflation is high" in Monetary Policy Report, June 2023, Sveriges Riksbank and C. Borio, M. Lombardi, J Yetman and E. Zakrajšek (2023), "The two-regime view of inflation", BIS papers No 133, Bank for International Settlements.

companies have passed on a more significant share of their costs from exchange rate changes to their prices over the past year than they did during the period up to 2019.

Imports' share of goods prices is around 50 per cent, which is higher than in other parts of private consumption (for instance services). If companies pass on in full the cost increases resulting from a depreciation of the krona against the euro of 15 per cent, goods prices would then increase by 7.5 per cent more in Sweden than in the euro area. Normally, however, this type of adjustment takes a long time. The fact that good prices in Sweden have now increased by around 5 per cent more than in the euro area therefore implies that companies have passed on most of their cost increases from the krona depreciation to consumer prices faster than usual. Please note that this is a simplified calculation. In practice, there are many other costs that can evolve differently between countries, at the same time as the composition of household consumption also differs. But the calculation can nevertheless give some indication of the effect the exchange rate has had on goods prices.

Figure 47. Relative development in goods prices between Sweden and the euro area and the krona exchange rate against the euro

Index of relative price levels and indices



Note. The blue lines show the relative index for goods prices excluding food in the HICP between Sweden and the euro area. In the left-hand figure the base year is 2015 and in the right-hand one it is 2019. The red lines show the index for the exchange rate SEK/EUR with base year 2015 in the left-hand figure and 2019 in the right-hand one.

Sources: Eurostat and the Riksbank.

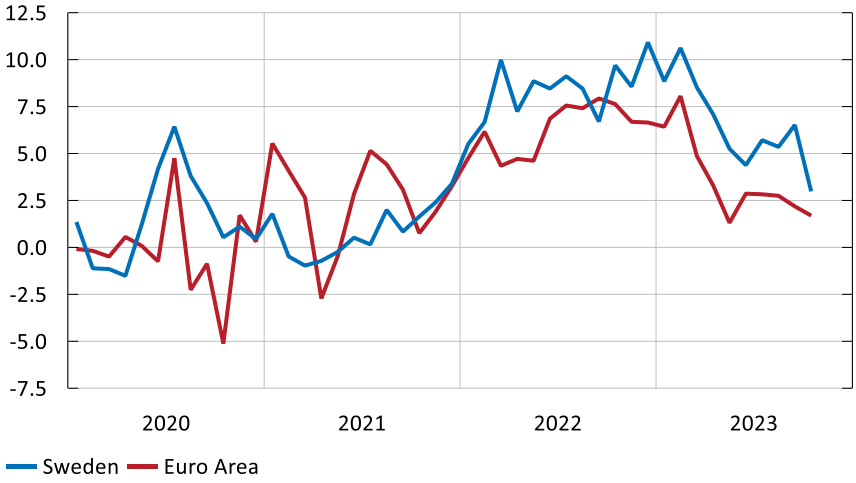
Exchange rate pass-through assessed to be more normal going forward

In the coming years, demand in the Swedish economy is expected to be lower than normal and inflation to be around 2 per cent. The fact that demand is weaker and inflation lower than in recent years indicates that the pass-through from the exchange rate to inflation will return to its historically normal level. The analysis also indicates that we have already seen most of the pass-through from the krona depreciation and thus do not need to expect more effects from the depreciation that has occurred in recent years. More high-frequency data on developments in goods prices provide

some support for this. For example, in Figure 48 we see that the three month change in goods prices in Sweden has approached the euro area.

Figure 48. Goods prices

Three-month change in per cent, calculated as an annual rate, seasonally-adjusted data



Source: Eurostat.

This conclusion is also compatible with an analysis made using the Riksbank's MAJA model. If the model assumes that the exchange rate pass-through has recently been greater than normal, the model gives the result that the contribution from the exchange rate depreciation will decrease more rapidly in the period ahead.[63] The forecast for inflation will then be lower than if the pass-through has been normal this past year.[64] The assessment of the effects of the exchange rate on inflation going forward are very uncertain, however, and in the forecast for inflation, the Riksbank has assumed a pass-through in line with the historical norm.

[63] The exchange rate pass-through is increased by assuming that import companies review their prices more often, which means that their prices will become more sensitive to changes in the costs for input goods. Changes in the prices of the goods they import that are driven by exchange rate changes then have a faster and greater impact on consumer prices.

[64] If the pass-through has been greater, then the weak exchange rate becomes a more important explanation for the upturn in inflation in MAJA. However, the model then at the same time needs to put less weight on other explanations of the high inflation. And these explanations have contributed to a higher persistence in inflation than the exchange rate. The assumption of a greater pass-through therefore means that the inflation forecast will be lower.