ARTICLE – The significance of the krona for inflation

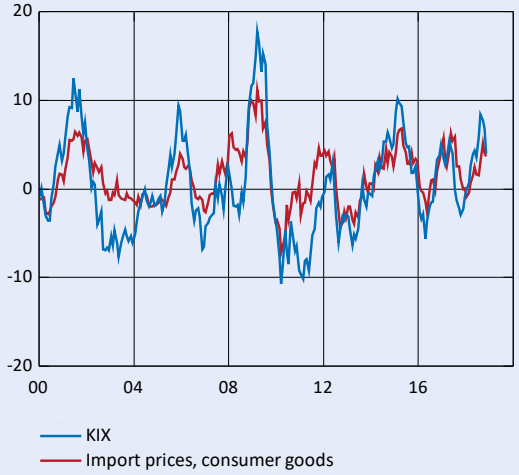
Changes in the krona exchange rate can affect both inflation and the real economy. For a central bank with an inflation target, like the Riksbank, the effects on inflation are particularly important to follow. This article describes how changes in the krona exchange rate affect inflation in Sweden. The link between the exchange rate and inflation is more complicated than it may appear at first glance. In 2018, the krona was considered to have been weaker than what is normal in the long term. Analysis by the Riksbank suggests that this has helped keep inflation in Sweden around the target of 2 per cent. As the inflation target is combined with a floating exchange rate, the Riksbank has no target for the development of the Swedish krona exchange rate. But monetary policy can help push inflation towards the target, partly as a result of its effects on the exchange rate. It is therefore important for the Riksbank to follow and analyse the development of the Swedish krona.

The krona exchange rate has a clear correlation with import prices for Swedish companies...

The most *direct* way that movements in the krona exchange rate affect Swedish inflation is via the price of imported products for Swedish companies *in the producer channel* or *"at the border"*.

Prices do not generally change continuously but are sluggish. How strong the immediate correlation between the exchange rate and import prices in Swedish companies depend in part on whether the importing company has a contract price in foreign currency or in Swedish krona. If the price is contracted in foreign currency, a movement in the krona exchange rate leads to an immediate change in the import price in krona.[13] There is a lot to suggest that exports from large countries and currency areas are largely priced in the exporter's currency.[14] The fact that much of Sweden's foreign trade is with the euro area and the United States could therefore indicate that a significant proportion of imports to Swedish companies are priced in foreign currency. Figure 3:10 shows the movement in the krona exchange rate together with the change in import prices of Swedish consumer goods at the producer level.[15] We see that there is a very strong correlation.

Figure 3:10. Nominal exchange rate and import prices in the producer channel
Annual percentage change



Note. The KIX (krona index) is a weighted average of the krona exchange rate against currencies in countries that are important for Sweden's international transactions. A higher value indicates a weaker exchange rate.

Source: National sources, Statistics Sweden and the Riksbank

... but a weaker correlation with aggregate consumer prices

There are several reasons why the exchange rate has a weaker correlation with aggregate consumer prices than with import prices "at the border".

Companies that import products and sell them on to Swedish consumers face a choice when the purchase price of the import changes: change the price to the consumer to compensate for the new purchase price, adjust the margins and keep the price to the consumer unchanged or a

[13] The price of export products being priced in the exporting country's currency is normally referred to as Producer Currency Pricing, PCP. When the exporter instead sets the price in the recipient country's currency, it is normally referred to as local currency pricing, LCP. For research studies of how the choice of pricing currency influences the effect of the exchange rate on import prices, see, for instance, M. Flodén and F. Wilander, "State dependent pricing, invoicing currency, and exchange rate pass-through", *Journal of International Economics*, 70, pp. 178-196, 2006 and G. Gopinath, O. Itskhoki, and R. Rigobon, "Currency choice and exchange rate pass-through," *American Economic Review*, 100, pp. 304-336, 2010.

[14] For example, one study indicates that 97 per cent of exports from the United States are priced in US dollars. See G. Gopinath, O. Itskhoki, and R. Rigobon, "Currency choice and exchange rate pass-through," *American Economic Review*, 100, pp. 304-336, 2010. A study of Swedish companies shows on the contrary that Swedish exports are mostly priced in foreign currency, see R. Friberg and F. Wilander, "The currency denomination of exports – A questionnaire study", *Journal of International Economics*, 75, pp. 54–69, 2008.

[15] In total, about 60 per cent of import price data is submitted to Statistics Sweden in foreign currency. These prices are then converted into Swedish krona at the current exchange rate.

combination of these. As mentioned earlier, prices are generally sluggish, and this is also true of prices to Swedish consumers.[16] This has to do with different costs associated with changing prices, which can reflect the risk of losing long-term customer relations or work on distributing new information about the price changes. If movements in the exchange rate can be assumed to be *temporary*, companies are probably less inclined to pass on the price change to the consumer than if the exchange rate movement is deemed to be *permanent*.

The propensity of companies to pass on cost changes for imported goods to consumer prices is affected by a number of *domestic factors*. The Swedish *economic situation* is one such factor. In an economic boom when demand is strong, it is generally easier to increase prices to consumers. *Competitive conditions* also play a role. Greater competition on the Swedish market could reduce the willingness of companies to pass on cost increases to consumer prices. For example a company may see a price that exceeds that of its competitors as the precursor to losing market share.[17] One often talks of companies' *price mark-ups*, which show prices in relation to costs. Higher competition tends to reduce price mark-ups, while a strong economic situation tends to increase them. Another example of domestic factors that can affect the prices of import goods to the consumer are costs for transport in Sweden.

So far, we have discussed the effects on imported goods between the producer and the consumer channel. One obvious circumstance that weakens the correlation between import prices at the border and aggregate consumer prices is that imported products only constitute part of the total CPI basket. Even though it is difficult to distinguish imported products from domestically produced ones, we can think of the CPI basket in terms of goods and services. *Goods* are mostly made up of *imported products* while *services* to a larger extent reflect *domestic conditions*.[18] Goods including food and services respectively make up about 45 per cent of the CPI basket.[19]

The exchange rate also influences inflation via indirect effects

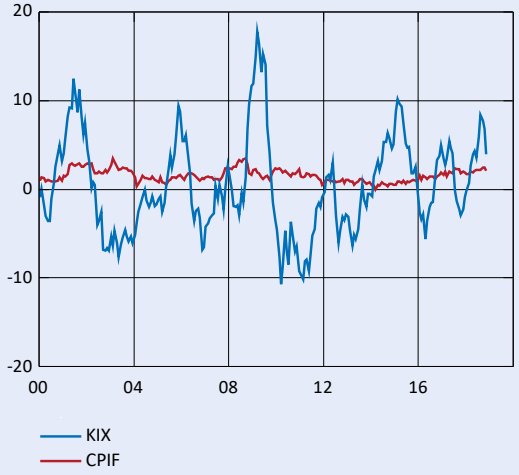
Movements in the exchange rate not only influence inflation via the effects on import prices, but may also influence inflation in more *indirect* ways. For example, a weakening of the exchange rate may also increase demand for Swedish exports abroad and boost output in Sweden. Via higher resource utilisation, this may, in turn, lead to developments such as rising wages and ultimately higher consumer prices in Sweden.[20]

The effect on Swedish exports of a changed krona exchange rate may, however, have been weakened by an increased occurrence of *global value chains*. An example is a Swedish export company that uses imported input goods from other countries. If the krona depreciates, not only does it help to make the company's exports cheaper abroad, but it also makes the imports of input goods more expensive.[21]

Difficult to observe the correlation between the exchange rate and inflation

As aggregate inflation in Sweden is affected by many factors in addition to the exchange rate, it is difficult to observe the correlation between the exchange rate and inflation in the data (see Figure 3:11).

Figure 3:11. Nominal exchange rate and the CPIF
Annual percentage change



Note. The KIX (krona index) is a weighted average of the krona exchange rate against currencies in countries that are important for Sweden's international transactions. A higher value indicates a weaker exchange rate.

Source: National sources, Statistics Sweden and the Riksbank

Another reason for the difficulties in observing the correlation has to do with the *causes* of exchange rate movements.[22] A weakening krona can, for example, indicate that investors are turning to other currencies because of *poorer prospects for the economy and inflation in Sweden*. We could then observe a weakening krona at the same time as falling inflation. This is due to the increased import costs "at the border" being offset by several domestic factors reflecting a deteriorating economic situation and making it less likely that companies will pass on cost increases for imported products to the consumer.

[16] See M. Apel, R. Friberg and K. Hallsten, (2004): "Price-setting behaviour in Swedish firms", *Economic Review* 2004: 4, Sveriges Riksbank.
[17] See M. Jonsson, "Increased competition and inflation", *Economic Review* 2007:2, Sveriges Riksbank.
[18] Service prices are also affected to a certain extent by the exchange rate. One reason for this is that imported input goods, which are affected by exchange rate movements, are used in service production.
[19] Remaining items are made up of energy and capital costs for housing.
[20] See the article "The impact of the exchange rate on inflation" in Monetary Policy Report December 2016, Sveriges Riksbank.
[21] See E. Frohm, "How do global value chains influence the effects of the krona exchange rate on exports?", *Economic Commentaries* No. 9, 2018, Sveriges Riksbank.
[22] See the article "The exchange rate and inflation" in Monetary Policy Report, April 2018, Sveriges Riksbank and V. Corbo and P. Di Casola, "Conditional exchange rate pass-through: evidence from Sweden", Sveriges Riksbank Working Paper Series No. 352, 2018.

But if the exchange rate deteriorates due to *factors abroad*, the likelihood may be greater that a depreciation of the exchange rate is linked to rising inflation in Sweden, as the depreciation of the krona is not being offset by domestic factors.

A more expansionary monetary policy in Sweden contributes to a weaker krona exchange rate, as it becomes less attractive to invest in Swedish interest-bearing assets compared with similar assets abroad. But it also contributes to stronger economic activity by, for example, stimulating household consumption. The stronger domestic economic activity in turn makes it easier for companies to pass on cost increases from higher import prices and also contributes to rising wages and more rapidly increasing service prices. We should therefore expect a depreciation of the krona as a result of a more expansionary monetary policy to be linked to rising inflation, as the effects on inflation of such a depreciation are reinforced by domestic factors. But a more expansionary monetary policy can in turn be a reaction to poorer prospects for the economy and inflation in Sweden, which illustrates the difficulties in drawing conclusions from observed data alone.

It is clear from Figures 3:10 and 3:11 that the krona exchange rate, seen over a longer period, has *intermittently weakened and strengthened* and hence *temporarily contributed to both higher and lower inflation*.

Weak krona during 2018...

In 2018, the krona has been on a weak level compared with the previous years (see Figure 3:12).

The Riksbank's assessment is that, in 2018, the krona has also been weaker than its long-term level.[23] This is explained by temporary factors having weakened the krona for a period. The depreciation of the krona at the start of 2018 was mainly due to a combination of expectations for a more expansionary monetary policy in Sweden and greater unease on international financial markets.[24]

For the rest of the year, the krona exchange rate remained on approximately the same level although it did vary somewhat. As at the beginning of the year, the two main factors affecting the krona were: the degree of unease on international financial markets and expectations regarding Swedish monetary policy.

Figure 3:12. KIX-weighted nominal exchange rate
Index, 18 November 1992 = 100

Note. The KIX (krona index) is a weighted average of the krona exchange rate against currencies in countries that are important for Sweden's international transactions. A higher value indicates a weaker exchange rate.

Sources: National sources and the Riksbank

... which has contributed to higher inflation in Sweden

As we saw earlier, it is difficult to draw conclusions about the effect of the exchange rate on inflation only by observing data. In some way, we must therefore try to isolate the effects of the exchange rate on inflation from the other significant factors. This can be done with the help of an analysis in the Riksbank's macroeconomic model, Ramses. Such model estimates indicate that the weak krona has helped to keep inflation around 2 per cent during 2018.[25]

But such an analysis also shows that low price mark-ups may have helped to prevent even higher inflation in 2018. This may reflect a lower propensity than normal to pass cost increases from, for example, imported products on to the consumer. But this dampening effect on inflation is significantly less than during 2014–2015, which can be a reflection of the improved economic situation since then. The fact that economic developments have a significant impact on the scope for companies to pass on cost increases to the consumer is also very much in line with the Riksbank's earlier analyses.[26]

The Riksbank has no target for the exchange rate, but it is an important component in the inflation assessment

Since 1993, Sweden has had a floating exchange rate in combination with an inflation target.[27] In other words, the Riksbank has no target for the Swedish krona exchange rate, regarding neither its level nor its development. As we have seen, the development of the krona is significant for the development of inflation. It is therefore important to make an assessment of the future krona exchange rate when

[23] This assessment is based on the real exchange rate, which shows the nominal exchange rate adjusted for differences in price levels between Sweden and abroad. There is evidence that real exchange rates over time have a tendency to move towards an equilibrium level. If the current level of the real exchange rate is weaker than the equilibrium level, the krona is expected to appreciate, and vice versa. See "Development of the Swedish krona in the longer term", article in Monetary Policy Report, October 2018.
[24] See the article "The exchange rate and inflation" in Monetary Policy Report, April 2018.
[25] See "Evaluation of the Riksbank's forecasts", Riksbank Studies, March 2019, Sveriges Riksbank.
[26] See, for example, the article "the development of costs and inflation" in Account of Monetary Policy 2013, Sveriges Riksbank, M. Apel, E. Frohm, J. Hokkanen, C. Nyman and S. Palmqvist, "Results from a survey on company pricing", *Economic Commentaries* No. 4, 2014, Sveriges Riksbank and the article "Why inflation has risen" in Account of Monetary Policy 2017, Sveriges Riksbank.
[27] The fixed exchange rate was abandoned on 19 November 1992. The inflation target was introduced on 15 January 1993, with the intention of being brought into force at the beginning of 1995.

making the forecasts for inflation. The Riksbank also needs to have an idea of the monetary policy required to push inflation towards the target at an appropriate pace. Monetary policy can help push inflation towards the target, partly as a result its effects on the exchange rate. It is therefore important for the Riksbank to follow and analyse the development of the Swedish krona.