

Box VIII-1

The effect of exchange rate movements on inflation

Chart 1

Exchange rate of the króna¹

Daily data January 3, 2007 – July 1, 2008



1. Exchange rate according to a broad merchandise index.
Source: Central Bank of Iceland.

Measured inflation has been much higher in recent months than was forecast in the last *Monetary Bulletin*, largely because of much stronger exchange rate pass-through than is suggested by recent historical experience. The magnitude, speed, and persistence of exchange rate changes can affect the strength of the pass-through. The króna fell sharply in mid-March, and by the end of the first quarter the exchange rate had depreciated by approximately 25% year-on-year. As Chart 1 illustrates, the exchange rate index has been extremely volatile since that time. The exchange rate has remained very low, however, and fell still farther in mid-June. Import price inflation is currently the most important source of consumer price inflation, whereas house price inflation was previously the principal driver of general inflation.

Exchange rate fluctuations make a considerable impact on inflation in Iceland ...

The impact of exchange rate shocks on domestic prices and inflation is usually summarised in terms of a phenomenon called exchange rate pass-through, which is the effect that a permanent exchange rate shock of a given magnitude has on prices and inflation over time. Table 1 gives estimates of exchange rate pass-through in Iceland using three different models: a simple cost-push model, a structural VAR model, and the Central Bank's quarterly macroeconomic model (QMM). The table reports the effects of a permanent 10% depreciation on annual inflation. The first two models are also re-estimated using a more recent time period in order to determine whether the pass-through has declined, as appears to be the case in a number of other countries (see, for example, Gagnon and Ihrig, 2004).

Table 1 The impact of a permanent 10% currency depreciation on annual inflation (percentage deviation from baseline scenario)

	Impact effect	After 1 quarter	After 2 quarters	After 3 quarters	After 1 year	After 2 years
Cost-push model ¹	0.8 (0.6)	2.2 (1.6)	2.9 (1.8)	3.3 (1.9)	2.6 (1.3)	0.0 (0.2)
VAR model ²	0.8 (0.8)	2.5 (1.5)	2.9 (1.7)	3.5 (2.0)	3.2 (1.3)	0.7 (0.0)
QMM model ³	0.4 (0.4)	1.1 (1.1)	1.3 (1.3)	1.4 (1.5)	1.1 (1.2)	0.1 (0.6)

1. A simple cost-push model, where inflation is determined by its own time lags and the lags of wage and domestic-currency import price inflation, estimated for the period 1961-1990 (see Gudmundsson, 1990). Figures in parentheses represent results for the period 1992-2008. 2. A structural VAR model containing domestic and foreign inflation, exchange rate changes, short-term interest rates, and the output gap, estimated for the period 1985-2005 (see Pétursson, 2008). Figures in parentheses represent results for the period 1990-2005. 3. Results based on the Central Bank's quarterly macroeconomic model (QMM), where monetary policy is determined by a simple Taylor rule. Figures in parentheses indicate effects in the absence of monetary policy response.

According to the cost-push model and the VAR model, a permanent 10% currency depreciation raises annual inflation by 2½-3 percentage points one year after the shock. The effects have more or less disappeared two years after the shock. The pass-through effects seem to have subsided, however, when the models are re-estimated from the early 1990s, as is the case in many other countries. The Central Bank's QMM yields similar results: inflation is about 1.5 percentage points higher six months after the shock and about 1 percentage point higher a year later, but the effects have almost disappeared after two years.

... and the effects seem to be more pronounced in Iceland than elsewhere

In general, the degree of exchange rate pass-through appears to be greater in Iceland than in many larger developed countries. According to the above estimates, the price level is about 4% higher

two years after the exchange rate shock, based on the cost-push and VAR models. According to Pétursson (2008), for example, a comparable result for the euro area is about 2%, while it is negligible in the United States. Based on a more recent time period, or using the QMM model, the pass-through effect declines to about 2%, but this has also occurred in most other countries; therefore, the pass-through effect remains considerably stronger in Iceland than in most other economies.

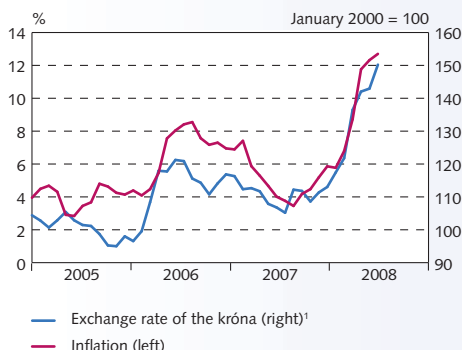
There could be numerous reasons for this (see Pétursson, 2008). For example, imports are generally priced in foreign currency because the Icelandic króna is rarely used in international trade (so-called producer currency pricing). In larger economies such as the US or the euro area, however, a large proportion of international trade is priced in the currency of the area concerned (local currency pricing). A currency depreciation would therefore have a less marked effect on the price of imported goods than it does in Iceland. Furthermore, because of the small size of the economy, few domestic manufacturers compete with imported goods. Substitutability between imports and domestic goods is inevitably less, and it is therefore easier to pass exchange rate movements through to retail prices. It can also be argued that the small and imperfect financial markets in Iceland make currency hedging more difficult, thus prompting importers to pass exchange rate changes through to prices.

Various interrelated factors contribute temporarily to strong exchange rate pass-through

In recent months, exchange rate pass-through seems to have been stronger than usual. Several factors may be at work. First, an accumulation of underlying cost pressures may have been unleashed when the króna fell in March. Wages have risen substantially in the recent term, and private sector wage costs have increased accordingly. While the króna was relatively strong, it was difficult for the service sector to raise prices in line with these wage increases because of direct and indirect competition with imported services. Private sector services prices rose much less, for example, than the past few years' rise in wages might suggest. In addition to the effect of a strong króna, it is likely that wages actually rose less than the wage index implied because of the massive increase in the number of foreign workers receiving minimum wages. On the other hand, the contractual wage settlements in March entailed a significant increase in minimum wages, which probably raised overall wage costs sharply for many service companies at a time of diminishing restraint from a strong króna.

Second, price stickiness may have declined because of the magnitude and persistence of the exchange rate shock. Businesses often maintain unchanged nominal goods prices for a considerable length of time in spite of changes in market conditions or exchange rates. There are various reasons for this sort of behaviour. For example, changing listed prices entails menu cost, such as the cost of printing new price lists or promotional brochures (like those distributed by IKEA to households throughout the country) and the cost of notifying consumers of new prices. Companies also risk losing market share if their competitors are slower to raise prices, and they run a certain reputational risk if the price increase over and above competitors' prices draws attention. In order to justify the cost of raising prices, the anticipated profit from the price change must exceed the cost. If the currency depreciation is substantial and is not likely to reverse itself, the cost of changing prices will be small in proportion to the profit generated by the higher price. Furthermore, a significant cost increase affecting all competitors simultaneously reduces

Chart 2
Inflation and exchange rate of the króna
January 2005 - June 2008



1. Exchange rate according to a broad merchandise index.
Source: Statistics Iceland.

the impact of a price hike on a company's reputation. Price changes therefore occur more frequently when exchange rate movements are large and inflation is high (see, for example, Devereux and Yetman, 2002).

Third, it is well to bear in mind that oil and commodity prices have increased substantially at the same time that the exchange rate of the króna has fallen. Not only do higher oil prices affect inflation directly, they also put upward pressure on the price of imported goods because of the increased cost of transporting the goods to Iceland.

Fourth, it has been very difficult for firms to hedge against currency risk through forward agreements in the months since the domestic FX swap market became dysfunctional. This may have led to both faster and stronger exchange rate pass-through effects.

Fifth, it is conceivable that exchange rate pass-through has become stronger because the credibility of monetary policy has weakened. It is clear that the ability of monetary policy to affect exchange rate developments has been limited recently, due to the impaired functioning of the foreign exchange swap market. Inflation can increase swiftly, and inflation expectations – even over longer horizons – can rise precipitously. Various studies of the relationship between exchange rates and inflation show that, in countries where the credibility of monetary policy is substantial and inflation expectations have been securely anchored, the pass-through of exchange rate shocks to inflation is dramatically reduced (see, for example, Mishkin, 2008). If the public is convinced that the central bank has the will to fight inflation with all means at its disposal, as well as the ability to achieve its objective within an acceptable time frame, an exchange rate shock is less likely to generate second-round effects on inflation, leading to a more transitory inflationary effect.

References

- Devereux, M. B., and J. Yetman (2002), "Price setting and exchange rate pass-through: Theory and evidence". In the book *Price Adjustment and Monetary Policy*, pp. 347-371, a compendium published following the eponymous conference held at the Bank of Canada, November 2002. Ottawa: Bank of Canada.
- Gagnon, J. E., and J. Ihrig (2004), "Monetary policy and exchange rate pass-through", *International Journal of Finance and Economics*, 9, pp. 315-338.
- Gudmundsson, G., (1990), "A statistical survey of inflation in Iceland, 1962-1989" (in Icelandic), in *Fjármálatíðindi*, 37, pp. 43-53.
- Mishkin, F., (2008), "Exchange Rate Pass-through and monetary policy", NBER Working Paper No. 13889.
- Pétursson, T. G., (2008), "How hard can it be? Inflation control around the world", Central Bank of Iceland Working Papers, forthcoming.