

Appendix 3 Forecast errors in Central Bank of Iceland inflation forecasts

The inflation forecast and analysis of economic prospects are one of the most important factors in the Central Bank's monetary decision-making process. Monetary policy actions can take up to one year to be transmitted with any real effect and up to two years before their impact is felt in full. Thus it is vital for the Bank to have the clearest possible view of the inflation trend and economic developments over that period.

Since the adoption of inflation targeting in March 2001, the Central Bank has published an inflation forecast two years ahead in Monetary Bulletin. Confidence intervals have been included with the forecast, since the great uncertainty surrounding economic developments would make a simple point forecast misleading. Confidence intervals take into account various uncertainties that could lead to substantial deviations from the point forecast. Among them are the global economic situation, exchange rate developments and various domestic aggregates. In evaluating inflation prospects two years ahead and possible monetary policy responses to it, the Central Bank also considers the risk profile of the forecast no less than the point forecast itself.

The inflation forecast is represented graphically in the form of a three-coloured fan chart. The darkest area of the fan chart is in the centre, where there is a 50% probability that inflation will fall in this range. It fans out into two lighter areas on either side show-

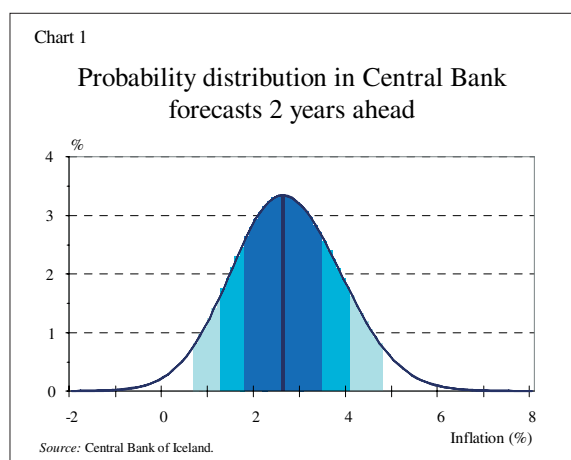
ing the 70% and 90% confidence interval respectively. The probability that inflation will fall outside the coloured range is 10%. Chart 1 shows the probability distribution for inflation on a two-year horizon, according to the Bank's latest forecast.

Table 1 Distribution of measured inflation based on inflation forecast confidence intervals

	No. of measurements	Within confidence interval		
		50%	75%	90%
Four quarters ahead	9	4	7	8
Eight quarters ahead	5	4	5	5

The Central Bank publishes a survey of its inflation forecasting errors once a year, most recently in *Monetary Bulletin* 2003/1. An analysis of the distribution of actual inflation across the confidence intervals has been made for the first time. Table 1 shows the proximity of the Central Bank's forecasts to measured inflation after inflation targeting was adopted in 2001. Nine forecasts four quarters ahead can therefore now be compared with measured inflation over the same period. Of these, four fell within the 50% confidence interval, seven within the 75% interval and eight within the 90% interval. One forecast fell outside the 90% confidence interval, produced just before the sharp depreciation in that year began. Distribution of forecasting errors therefore closely matches the given probability distribution. Only five forecasts over a horizon of eight quarters can be tested. Four turned out to fall within the 50% confidence interval and all five within 75%.

It would be rash to draw sweeping conclusions from so few data points. Nonetheless, the eight-quarter forecasts have been relatively close to the centre of the confidence interval. All forecasts are based on the assumption of an unchanged policy interest rate over the horizon. If a forecast indicates that inflation will deviate substantially from the target, the Bank is obliged to take measures to steer it back as close as possible. The rate of inflation was much higher than the Central Bank forecast in the initial period after



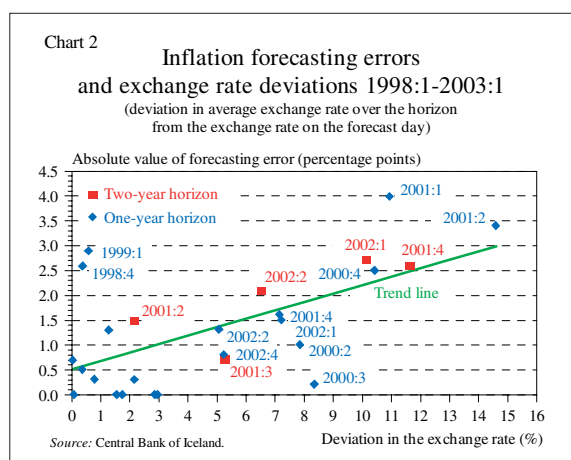
the inflation target was adopted, in particular because the exchange rate developed along completely different lines from the standard assumption that it would remain unchanged – in the event, the króna depreciated. However, a tightening of the monetary stance squeezed domestic demand and led to an appreciation of the króna, and inflation was fairly soon reined in.

Table 2 Central Bank forecasting errors following the adoption of inflation targeting

%	No. of measurements	Bias	RMSE
Four quarters ahead	9	0.13	1.46
Eight quarters ahead	5	0.60	0.67

The bias has been considerably smaller in forecasts four quarters ahead than over a longer horizon. Both the relatively small bias compared with longer forecasts, and the high root mean square error (RMSE), are caused by initial under-forecasting after the inflation target was adopted and over-forecasting in 2002 when inflation was brought to heel much earlier than the Bank had expected; these over- and undershoots cancel each other out. The RMSE in forecasts one year ahead is similar after the target was adopted (1.46) to that in forecasts from 1994 (1.63).

Chart 2 compares the Bank's forecasting errors with the average exchange rate over the forecasting period. There appears to be a fairly clear correlation



between changes in the exchange rate and forecasting errors. After it moved onto an inflation target, the Bank has published inflation forecasts with a two-year horizon. The horizon has been completed for the first five forecasts and their errors are compared with the change in average exchange rate over the same period. These forecasts are plotted on the chart with red squares. Blue diamonds show the errors in forecasts one year ahead and the corresponding change in the average exchange rate. In most of the forecasts, the error is fairly close to zero. Large errors are revealed in the forecasts from late in 2000 and in 2001, reflecting the sharp depreciation of the króna immediately after the monetary framework was changed. Two forecasts (Q4/1998 and Q1/1999) stand out for having large errors even though the exchange rate remained virtually unchanged over their horizon. At the time that these forecasts were produced, the Central Bank was developing inflation forecasting models to take fuller account of the macroeconomic impact of demand pressures, which were running high then but were beyond the scope of existing models. The new models were first run shortly afterwards and have been used ever since, with upgrading as needed. Apart from these two forecasts, the largest forecasting errors have occurred in periods of marked exchange rate volatility, which as the chart shows account for the greatest part of the deviation.

Table 3 shows the bias and RMSE in the Bank's forecasts since 1994. Both the bias and the RMSE rise in pace with the length of the forecast horizon, which is natural since the uncertainty increases further ahead. There are no indications of systematic under- or over-forecasting of inflation over this period.

Table 3 Central Bank inflation forecasting errors

1994:1-2003:1	Forecast horizon			
	Q1	Q2	Q3	Q4
Bias	0.00	-0.07	-0.09	-0.19
RMSE	0.39	0.85	1.32	1.63