

## Box 2

### **INFLATION FORECASTS DERIVED FROM MONETARY INDICATORS**

This box presents an update of ECB staff inflation forecasts derived from monetary indicators and discusses the performance of the relevant models in recent quarters. It is thereby a follow-up on the information provided in a box published in the March 2005 Monthly Bulletin. Essentially, the assessment of risks to price stability derived from monetary analysis is based on the close empirical relationship between inflation and the “low frequency” or more persistent components of monetary growth. One way of using this relationship for forecasting future price developments in real time is to employ simple leading indicator models for HICP inflation

based on various monetary variables.<sup>1</sup> Obviously this is very much “work in progress” and further analysis will need to be carried out.

The leading indicator models forecast average inflation over a specific horizon using past values of inflation and past values of a monetary indicator. In practice, a number of such models are employed, each drawing on the information of a specific monetary indicator. The monetary indicators considered are: M1 growth, M2 growth, M3 growth, the growth of M3 corrected for the estimated impact of portfolio shifts, the growth of MFI loans to the private sector, a P-star measure of excess liquidity based on M3 and a P-star measure of excess liquidity based on M3 corrected for the estimated impact of portfolio shifts.

There are two elements in this approach that can be seen as reflecting in a simple way the need to look at underlying trend dynamics of monetary growth when assessing inflationary risks. First, the models focus on the average inflation rate over the next six or twelve quarters. Such averaging smoothes out the short-term noise contained in quarter-by-quarter developments. Second, looking at a variety of monetary indicators rather than only headline M3 reflects, albeit in a stylised way, the broad analysis of the components and counterparts of M3 that is regularly undertaken to help extract the signals from monetary developments relevant for risks to price stability. In this respect, some attention has been paid to the simultaneous strengthening of growth in M3 and in loans to the private sector since mid-2004, which is suggestive of more fundamental driving factors being at work. In practice, emphasis has been placed on a measure of M3 that is corrected for estimates of portfolio shifts which are assumed to have no immediate bearing on inflation.<sup>2</sup>

### Risks to price stability implied by monetary indicators have remained on the upside

Charts A and B present the forecasts of annualised inflation over the coming six and twelve quarters respectively, derived on the basis of the various monetary indicators. The six-quarter horizon is relatively short for capturing the relationship between the more persistent components of monetary growth and inflation, but it has the advantage of being comparable to that of other forecasting frameworks while at the same time still capturing the notion of smoothed and thus more underlying developments. The charts show the minimum, maximum and median of the forecasts for successive vintages of forecasts, where the forecasts shown are those made in real time (i.e. on the basis of the data and models available then and not once revisions have been incorporated and estimations updated). This representation can be seen as a simple illustration of how the risks to price stability derived from monetary analysis have evolved over recent quarters.

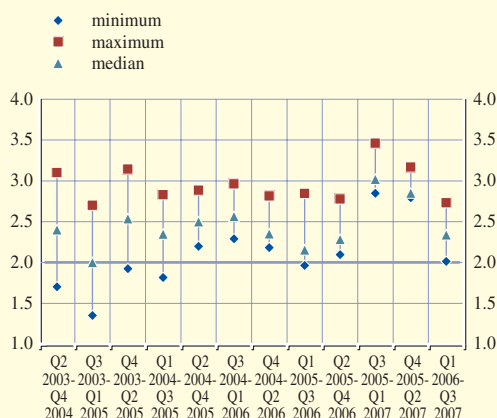
Two observations can be made with regard to this representation. First, the medians of both the six and twelve quarter-ahead inflation forecasts have more or less consistently been above 2% in the period since mid-2003. In the case of the twelve-quarter horizon, this indication of risks to price stability has been rather stable, with median inflation forecasts in a band of between 2½% and 3%. In this respect, it has to be noted that the more elevated forecasts pertaining to

1 For a description of the approach see S. Nicoletti-Altimari, “Does money lead inflation in the euro area?”, ECB Working Paper No 63, May 2001. These and other approaches used in the ECB to forecast inflation have been discussed in the article entitled “Monetary analysis in real time” in the October 2004 issue of the Monthly Bulletin.

2 For a description of the construction of this measure see the box entitled “Approaches to identifying and estimating portfolio shifts into and out of M3” in the January 2005 issue of the Monthly Bulletin. Further small corrections for past outliers and certain volatile components have also been introduced in the estimation procedure.

**Chart A The range of annualised inflation forecasts over the next six quarters from bivariate leading indicator models**

(annualised percentage growth rates; real-time results of the various forecast vintages)

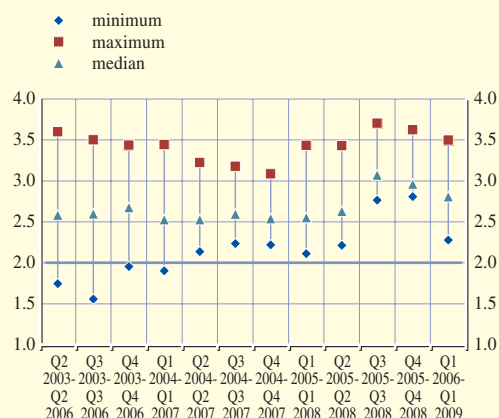


Source: ECB estimates.

Note: The chart shows the range of the annualised inflation forecasts from seven bivariate leading indicator models of inflation. Each forecast is based on information available at the time the forecast was made. For example, the forecast for Q1 2006 to Q3 2007 contains information on money and inflation up to and including Q1 2006. For the methodology underlying the inflation forecasts of the seven models, see the references in footnote 1 of this box.

**Chart B The range of annualised inflation forecasts over the next twelve quarters from bivariate leading indicator models**

(annualised percentage growth rates; real-time results of the various forecast vintages)



Source: ECB estimates.

Note: The chart shows the range of the annualised inflation forecasts from seven bivariate leading indicator models of inflation. Each forecast is based on information available at the time the forecast was made. For example, the forecast for Q1 2006 to Q1 2009 contains information on money and inflation up to and including Q1 2006. For the methodology underlying the inflation forecasts of the seven models, see the references in footnote 1 of this box.

the second half of 2005 reflect the impact of the hurricane-related surge in oil prices on HICP inflation, which entered the model forecasts via temporarily higher lagged inflation values. Such an effect can be seen as a distortion to the price series which somewhat obscures the underlying signal coming from monetary developments.

Second, in the period since mid-2004, even the minimum forecast values have typically been above 2%, and the breadth of the range of forecasts (measured as the distance between maximum and minimum forecasts) has on average been smaller than in the period before mid-2004. This reflects a stronger co-movement of money growth and loan growth, and a stronger co-movement of growth in headline M3 and growth in M3 corrected for the estimated impact of portfolio shifts. These co-movements point to strong dynamics in the underlying or low frequency component of monetary growth.

Taken together, these observations suggest that the risks to price stability stemming from monetary indicators have remained on the upside and that this signal has become clearer in the period since mid-2004. However, when interpreting the results of this exercise, the simplicity of the indicator models and the high uncertainty surrounding the forecasts need to be kept in mind.

**Inflation forecasts based on underlying monetary trends have performed relatively well**

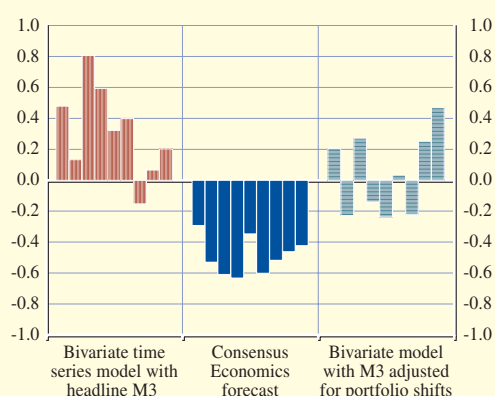
The uncertainties associated with a narrowly focused assessment of the inflationary risks implied by monetary analysis can be illustrated with the forecasts of the indicator model based on growth in headline M3. Chart C shows that in retrospect, these forecasts have mostly

overstated actual HICP inflation, in line with the assessment that the high level of monetary growth in past years reflected to a large extent the impact of heightened uncertainty rather than underlying monetary dynamics. On the other hand, macroeconomic forecasts, such as those by Consensus Economics, have consistently understated actual HICP inflation, reflecting most likely the succession of upward price shocks in recent years (e.g. the rise in food and oil prices as well as administered prices).

By contrast, forecasts derived from a monetary indicator model based on growth in M3 corrected for portfolio shifts have been relatively unbiased and witnessed smaller forecast errors. While the sample is obviously too short to speak of statistical significance, this confirms that monetary analysis has proved to be a reliable complement to the economic analysis and emphasises the need for an encompassing monetary analysis in order to extract the signals in monetary trends that are relevant for price stability.

**Chart C Forecast errors of real-time HICP inflation forecasts over six quarters**

(percentage points; quarterly forecast vintages in the period from the third quarter of 2002 to the third quarter of 2004)



Source: ECB estimates and calculations.

Notes: Forecast errors are defined as the difference between the forecast and the actual outcome. The annual inflation rates provided by Consensus Economics are used to construct a real-time forecasted HICP index. This constructed series is then seasonally adjusted in order to allow the calculation of annualised rates of growth.