

**Box 1****UNDERLYING MONETARY DYNAMICS: CONCEPT AND QUANTITATIVE ILLUSTRATION**

The primary objective of the ECB is to maintain price stability in the euro area. Given that inflation is a monetary phenomenon over the medium to long term, the ECB has assigned an important role to money in its monetary policy strategy.

One way of making this theoretical principle operational for historical analyses (i.e. for backward-looking ex-post analyses) is to study the link between the low-frequency component (i.e. the persistent component) of inflation and an appropriately defined measure of “money”. Recent studies focussing on this type of analysis for a number of countries and over long time horizons<sup>1</sup> have strengthened the view that the relationship between underlying trend movements in money growth and inflation is part of the deep structure of the economy. First, this relationship remained intact under a large number of different policy regimes. Second, the relationship remained strong in countries with a history of low inflation, as well as in countries with high inflation. Finally, the underlying trend movements in money growth seem to precede those of inflation by a number of years, creating scope for monetary policy to contain inflationary pressures that stem from the underlying trend dynamics in money if they can be identified promptly.

In real time, policy-makers obviously have to rely on the information available to them. Tools that are designed to analyse past behaviour (and that draw on information from the entire time series, instead of the information available at the time of a policy decision, in constructing a measure of the underlying trend) are therefore not very useful. To address this issue, the analysis relevant for policy-makers has to be broad-based, employing a number of empirical techniques that can be used to identify the underlying monetary expansion in real time, relying only on the available information. Each of these techniques is inevitably imperfect. This box discusses a number of such techniques, ranging from time series tools, to exclusion-based measures and on to structural models, and presents a number of stylised results for “underlying monetary growth” in recent quarters.

**Time series measures**

Measures within this class attempt to discriminate between the “temporary” and “persistent” components of observed monetary developments using a variety of statistical filters, where the

<sup>1</sup> For details, see the speech presented by J. Stark, Member of the Executive Board, on “Enhancing monetary analysis” at the conference “The ECB and its Watchers IX” in Frankfurt am Main on 7 September 2007, and the references made therein.

latter reflects the empirical estimate of the “underlying” money growth.<sup>2,3</sup> An alternative time series approach interprets “underlying” money growth as the component of money growth that is common to various monetary variables, e.g. a large set of sub-components, counterparts and sectoral holdings of M3, and seeks to extract this common element using so-called factor models.<sup>4</sup>

### Exclusion-based measures

This approach constructs measures of monetary dynamics that focus on certain money holding sectors or on certain MFI liabilities included in M3, on the basis that these elements are more representative of underlying monetary developments. For example, one might argue that households’ holdings of M3 provide more insight into the underlying trends in money growth than those of non-monetary financial institutions. Two main arguments would support this view: first, households’ money holdings are generally considerably less volatile than M3 holdings of non-monetary financial institutions and, second, households’ holdings of M3 are more closely linked to spending decisions, thus offering a more direct link to developments in consumer prices. At the same time, as in the case of exclusion-based measures used to evaluate inflation developments, the usefulness of any particular measure depends, to a large extent, on the specific situation and is unlikely to become generally applicable to all circumstances.

### Structural and semi-structural measures

Finally, one can use semi-structural or structural approaches to construct an empirical measure for capturing the theoretical concept of “underlying money growth”.

In a semi-structural approach,<sup>5</sup> expert judgement is combined with analysis that is based on econometric money demand models. The objective of this approach is to distinguish various components of monetary developments, namely:

- those attributable to identifiable special factors and distortions without a link to future inflationary pressures;
- those that result from current changes in the determinants of money, but do not signal immediate risks to price stability;
- those that result from current changes in the determinants of money that signal risks to price stability; and
- those influenced by other monetary shocks not captured by money demand models, such as a possibly temporary increase in the efficiency of the banking sector, that have an impact on risks to future price stability.

2 See, for example, L. Christiano and T.J. Fitzgerald, “The bandpass filter”, *International Economic Review*, 44(2), 2003, pp. 435-465.

3 See A. Bruggeman, G. Camba-Mendez, B. Fischer and J. Sousa, “Structural filters for monetary analysis: inflationary movements of money in the euro area”, ECB working paper No 470, 2005.

4 For a description of the methodology, see, for example, R. Cristadoro, M. Forni, L. Reichlin and G. Veronese, “A core inflation indicator for the euro area”, *Journal of Money, Credit and Banking*, Vol. 37, No 3, June 2005, pp 539-560.

5 For details, see K. Masuch, H. Pill and C. Willeke, “Framework and tools of monetary analysis”, H.-J. Klöckers and C. Willeke (eds.), *Monetary Analysis: Tools and Applications*, ECB, 2001.

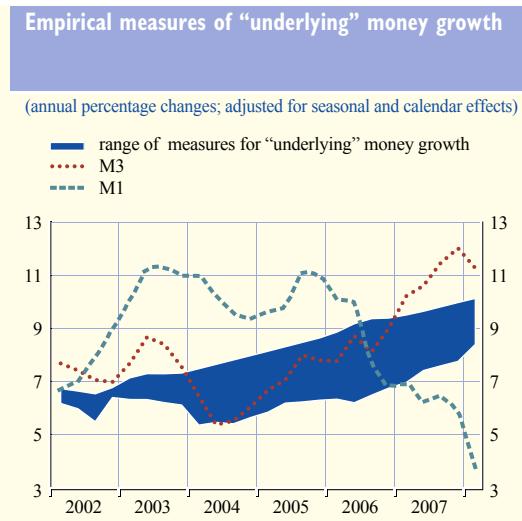
In this context, a natural measure of “underlying” monetary growth is the sum of the latter two components, namely those elements that point to risks to price stability. This is the core objective of undertaking the monetary analysis.

One example of a correction of headline M3 growth within this framework was the provision of the M3 series corrected for the extraordinary portfolio shifts that occurred between 2001 and 2003.<sup>6</sup> This analysis led to the construction of a corrected or “underlying” monetary growth series that excluded the significant portfolio shifts into safe and liquid monetary assets at a time of heightened economic and financial uncertainty in the aftermath of a significant stock market correction and the terrorist attacks of 11 September 2001.

Instead of using the decomposition of money growth into the contributions stemming from its main determinants, one can use a structural model in which the impact of “shocks” on M3 growth that vary by nature and source can be identified and quantified. One example for such a modelling approach is a structural dynamic stochastic general equilibrium (DSGE) model with financial frictions and an explicit banking sector.<sup>7</sup> Within such a model, the “underlying” monetary growth is measured empirically as the sum of those “shocks” that should be related with inflationary pressures (which excludes, in particular, money demand shocks related to pure portfolio decisions). The very stylised character of such models, however, calls for considerable caution when used in real-time policy applications.

All empirical measures described above are obviously imperfect measures of the concept of “underlying” monetary developments. Therefore, it is necessary to look at a range of different approaches, rather than to rely on one alone. In addition, it must be borne in mind that the signalling quality of different empirical measures may vary over time. A range of such empirical measures, in addition to headline M3 and M1 growth, is shown in the chart above. Despite the shortcomings listed above, a number of conclusions can be drawn from this chart:

- the underlying pace of monetary expansion remains strong;
- although “underlying” money growth (when analysing the mean or median of these measures) appears to have broadly stabilised in recent quarters, as short-term interest rates have risen, there is nevertheless little sign of a significant moderation; and



Source: ECB, ECB calculations.

Note: The range of measures capturing “underlying” money growth is based on one exclusion-based measure (estimate of annual growth of household’s holdings of M2 plus repurchase agreements) and three time series measures (asymmetric full sample Christiano-Fitzgerald bandpass filter for movements of M3 growth with a periodicity over 10 years, multivariate filter as described in the source provided in footnote 3 of the box and a dynamic factor model).

6 For a description, see the article entitled “Monetary analysis in real time” in the October 2004 issue of the Monthly Bulletin.

7 The model is described in Box 2, entitled “A structural decomposition of money growth”, in the article entitled “Interpreting monetary developments since mid-2004” in the July 2007 issue of the Monthly Bulletin.

- M3 growth currently overstates the pace of monetary expansion, while M1 growth currently understates it.

One explanation for the latter stylised observation can be found in the different impact of the prevailing relatively flat yield curve on different monetary aggregates. On the one hand, the flat yield curve stimulates M3 growth in the short run by making the remuneration of shorter-term monetary assets attractive in comparison with riskier, longer-maturity assets outside M3. On the other hand, the flat yield curve partially reflects the impact of past increases in key ECB interest rates and the effects of the financial market turmoil on the short end of the yield curve. Both factors increase the opportunity costs of holding assets included in M1, leading to substantial shifts out of assets included in M1, mainly into assets included in the broad monetary aggregate that are remunerated closer to market rates.<sup>8</sup>

<sup>8</sup> For a description of this issue, see Box 3, entitled "The reaction of euro area M3, M1 and loans to changes in interest rates", in the article entitled "Interpreting monetary developments since mid-2004" in the July 2007 issue of the Monthly Bulletin.