

## Monetary developments in the euro area since the beginning of monetary union

The euro-area money stock M3 initially went up sharply at the beginning of monetary union. Sight deposits, in particular, were replenished heavily. However, as a result of the ECB Governing Council gradually raising interest rates since autumn 1999, monetary growth has been slowing down markedly since spring 2000. The real monetary overhang that had been built up in the past has now vanished. Therefore, there are currently no more inflationary risks emanating from the monetary side. So far, though, monetary growth in the individual euro-area countries has been quite mixed; besides heterogeneous financial market structures and unequal positions in the business cycle, national special factors also played a role. Owing to this heterogeneity and to problems in the statistical recording of marketable components, monetary growth has not always been easy to interpret. All the same, though, the Bundesbank's own empirical studies have shown that the long-run demand for money in the euro area is stable. In addition, the money stock M3, despite its large share of components bearing market rates of interest, is sufficiently controllable. To that extent, this confirms the results obtained so far by the ECB. In the Eurosystem's monetary policy strategy, the money stock justifiably plays a prominent role.

## Introduction

*M3 a prominent feature of the monetary policy strategy*

The broad money stock M3 is a prominent feature of the Eurosystem's monetary policy strategy. The Governing Council of the ECB defined a reference value for M3 growth which, since the launch of monetary union, has been 4½%. It is a yardstick used to assess the ongoing development of the money stock. In addition, it analyses a broad range of non-monetary indicators in terms of their informative value for future inflation dangers.

*Approaches to monetary analysis*

Monetary analysis seeks to identify factors explaining shorter-term monetary growth in order to achieve a more precise estimation of the price effects of monetary aggregates. To that end, the monetary aggregate and its components and counterparts are subjected to institutional and descriptive scrutiny. In some cases, an analysis of the structure and dynamics of national contributions to M3 may also provide useful information. In addition, econometric approaches are used to quantify the economic determinants of money demand, such as interest-rate movements and cyclical movements. On that basis, indicators can be developed for assessing liquidity provision, which can provide additional information on dangers to future price stability.

### Monetary developments in the euro area since the beginning of monetary union

*Rapid rate of M3 growth at start followed by slower growth*

Since European monetary union (EMU) was launched at the beginning of 1999, growth in the money stock M3 has clearly exceeded the 4½% reference value. Over the nearly

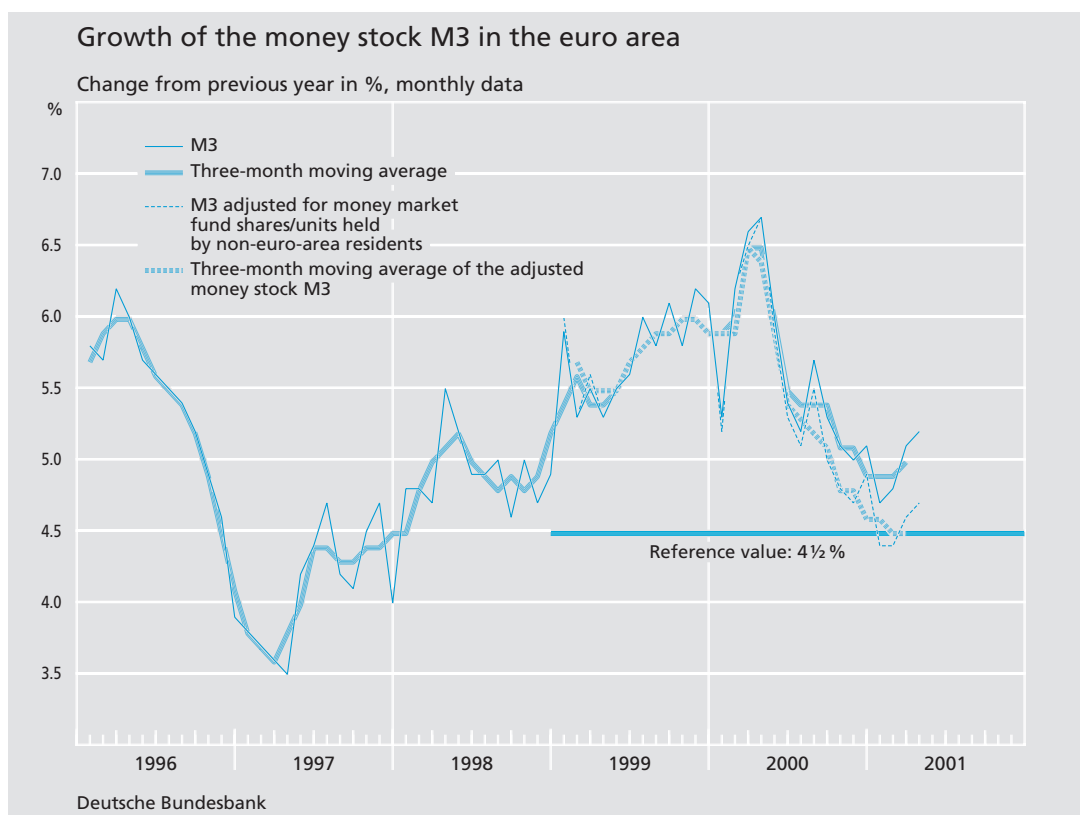
two-and-a-half years since then, annual M3 growth has averaged roughly 5½%.<sup>1</sup> In the run-up to EMU, monetary growth had been relatively steady in the soon-to-be member countries, only to pick up speed once the euro was introduced. When monetary union was launched in January 1999, money holdings skyrocketed, continuing their strong growth until the second quarter of 2000. The three-month moving average of annual growth rates went up from 5.6% in the first quarter of 1999 to 6.5% in the February-April 2000 period. Afterwards, the pace of growth slowed down under the spell of the incremental short-term interest-rate hikes beginning in November 1999. As the year 2000 came to a close, the three-month moving average of monetary growth was only 4.9%. Since then, it has held steady at this level for the most part.

In the first year of European monetary union, M3 growth was characterised especially by the distinct increase in sight deposits. At the beginning, major uncertainty regarding the introduction of the euro and extensive repatriation of Euro-market deposits invested outside of the euro area were to blame (see also page 47).<sup>2</sup> In addition, propensity to hold

*Similar pattern in sight deposits ...*

<sup>1</sup> The figures mentioned here are not adjusted for purchases of money market fund shares/units by non-euro-area residents (see page 42); in the meantime the ECB has begun to adjust these figures accordingly.

<sup>2</sup> The distorting impact of those two special factors at the beginning of monetary union is quantified in: ECB, Monthly Bulletin, May 2001, page 56, Box 4 "Identification and quantification of the distortion of M3 at the start of Stage Three of EMU on the basis of a univariate linear time series model". Comparable results for 1999 are also reached by: Brandner, P. and Schubert, H., *Geldmengenentwicklung im Übergang zur Währungsunion*, in: *Österreichische Nationalbank*, Berichte und Studien 2/2000.



liquid forms of assets was promoted by the temporary reduction in short-term interest rates in April 1999. With the interest-rate turnaround in November 1999 and the resultant increase in the opportunity costs of holding non-interest-bearing or low-interest-bearing overnight deposits, their contribution to monetary growth then underwent a sustained decline (see table on page 42). That trend was temporarily interrupted by expectations of interest-rate increases in spring 2000, causing a brief and sharp rise in sight deposits. Ultimately, though, sight deposits' contribution to M3 growth shrank from 4 1/2 percentage points in the third quarter of 1999 to 1 percentage point in the first quarter of 2001.

Growth of currency in circulation outside the monetary financial institutions sector (MFI sector) increasingly lost steam in the past year, too, after having recorded year-on-year growth in December 1999 of just under 8 1/2 % in connection with Y2K. As of late, the volume of coins and notes in circulation outside the MFI sector in the euro area has been 3 % below its previous year's level. Cash returning from other countries – particularly return flows of D-Mark banknotes – in the run-up to monetary union probably contributed to that development.

*... and in  
currency in  
circulation ...*

Deposits with an agreed maturity of up to three months, which carry rates of interest which are generally less oriented to money market rates, were likewise distinctly increased up to and into the third quarter of

*... and in short-  
term savings  
deposits*

## Contribution of components of the money stock to the rate of growth of M3 in the euro area

Percentage points; end-of-quarter/end-of-month levels

Time	Money stock M3 <sup>1</sup>	Currency in circulation	Overnight deposits	Deposits with a maturity of up to two years	Deposits at notice of up to three months	Repo transactions	Money market fund shares/units and money market paper (net)	Debt securities with a maturity of up to two years (net)
1998 4th qtr	4.9	0.1	3.4	- 0.1	1.8	- 0.6	0.2	0.1
1999 1st qtr	5.5	0.1	4.2	- 0.1	1.5	- 0.7	0.7	- 0.4
2nd qtr	5.6	0.2	4.2	- 0.7	1.8	- 0.7	1.1	- 0.3
3rd qtr	6.1	0.4	4.5	- 0.6	1.7	- 1.0	1.2	- 0.1
4th qtr	6.1	0.6	3.3	- 0.5	1.1	- 0.6	1.7	0.4
2000 1st qtr	6.6	0.4	3.6	0.1	0.3	- 0.1	1.7	0.5
2nd qtr	5.4	0.4	2.5	1.3	- 0.6	0.0	1.3	0.4
3rd qtr	5.3	0.2	2.3	2.1	- 1.1	0.2	1.3	0.2
4th qtr	5.1	- 0.1	2.3	2.2	- 1.4	0.6	0.9	0.4
2001 1st qtr	5.1	- 0.1	0.9	2.9	- 1.0	0.5	1.2	0.6
2001 Jan.	4.7	- 0.1	0.7	2.9	- 1.3	0.8	1.3	0.4
Feb.	4.8	- 0.1	0.9	2.7	- 1.2	0.7	1.1	0.5
Mar.	5.1	- 0.1	0.9	2.9	- 1.0	0.5	1.2	0.6
Apr.	5.2	- 0.2	0.9	2.8	- 0.8	0.4	1.3	0.7

<sup>1</sup> Annual growth rate.

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1999. With interest rates rising as the end of 1999 approached, the interest-rate disadvantage of these deposits widened; consequently, they were steadily reduced.

The development of M3 components bearing little or no interest was partly offset by diametrically opposed developments in components bearing market-related interest rates. Deposits with an agreed maturity of up to two years were reduced over the course of 1999 but were sharply increased in 2000 and the first quarter of 2001. Their contribution to M3 growth rose from - ½ percentage point in December 1999 to just under three percentage points in April 2001. Negotiable instruments likewise put a damper on monetary growth in the first year of monetary union; it was only after the turnaround in interest rates in the

fourth quarter of 1999 that they contributed to M3 growth. In the run-up to Y2K, German money market paper and short-term bank debt securities were the focus of attention as safe, liquid forms of investment.

Purchases of negotiable paper by non-euro-area residents pose a particular problem regarding the correct statistical recording of the money stock. The money stock is designed to encompass only liquidity held at euro-area MFIs by euro-area non-banks as deposits and negotiable instruments. Deposits and short-term paper held by non-euro-area residents are not included.<sup>3</sup> However, statis-

*Statistics distorted by non-euro-area residents' purchases of negotiable paper*

<sup>3</sup> The idea behind this way of thinking is that, in a large and relatively closed economic area such as the euro area, domestic prices are most likely to be influenced by funds held at domestic banks by domestic depositors.

*Countervailing development in components bearing market-related interest rates*

tically speaking, it is extraordinarily difficult to find out who the holders of negotiable securities are. At present, only money market fund shares/units held by non-euro-area residents which have been issued by euro-area MFIs can be sufficiently quantified, and not holdings of money market paper and short-term bank debt securities. Apparently money market fund shares/units were in great demand among non-euro-area residents starting in mid-2000. This caused the attendant statistical distortion of the annual rate of M3 growth in 2000 to increase incrementally; as of late this distortion had reached  $\frac{1}{2}$  percentage point (see chart on page 41).

*Monetary expansion driven by strong lending to the private sector*

The driving force behind monetary growth, which was quite dynamic up to and into spring 2000, was a sharp increase in lending to the private sector. Even in the run-up to monetary union, falling lending rates and a brightening economic outlook led to a gradual increase in credit expansion. From the introduction of the euro until and into the second quarter of 2000, growth rates for lending settled in at a persistently high level despite the fact that lending rates went back up. Between January 1999 and April 2000, outstanding loans to the private sector maintained an average year-on-year increase of 10% each month. Probable reasons include the bright economic outlook, extensive direct investment abroad financed by loans, corporate mergers and acquisitions, and booming real-estate markets in some euro-area countries. An additional factor was that in spring 2000, private households, in particular, brought forward their taking up of housing loans in expectation of further increases

in lending rates. As the year progressed, the continuing rise in the level of interest rates then caused lending to cool off considerably. Telecommunications companies' large demand for finance resulting from the auctioning-off of UMTS licences temporarily interrupted the slowdown in credit expansion, yet it did not alter the trend. As of late, the annual growth rate of lending was just shy of  $8\frac{1}{2}$  %.

By contrast, lending to the public sector has tended to have a dampening impact on monetary developments since the introduction of the euro. Owing not least to strong economic growth and an attendant reduction in the need for finance, loans to general government grew only moderately in the first year of monetary union. In the following year, general government, probably also due to proceeds from the auctioning-off of UMTS licences, was able to reduce its loans slightly. Moreover, securitised lending to the public sector went down distinctly.

*By contrast, lending to the public sector on the decline*

Strong lending to the private sector in the euro area contrasted with dynamic monetary capital formation at the beginning of monetary union. The wait-and-see attitude of market participants in the run-up to the introduction of the euro led to a strong catching-up effect particularly in net sales of long-term bank debt securities; however, this effect had already dissipated by mid-1999 owing to a flat yield curve. Only when long-term interest rates rose markedly and the yield curve became steeper as the year 1999 went on did the propensity of enterprises and individuals to deposit funds at banks over the longer

*Monetary capital formation subject to interest-rate-cyclical fluctuations*

term go back up distinctly. It was only temporarily dampened by uncertainty at the beginning of 2000 concerning future interest-rate movements. As the end of 2000 approached, though, expectations of interest-rate cuts and a renewed flattening of the yield curve caused domestic MFIs' willingness to invest over the longer term to wane distinctly. The volatile situation in the financial markets in spring 2001 exacerbated those tendencies.

*Outflows of funds in foreign payments*

Owing to a substantial volume of direct investment and portfolio investment in non-euro-area countries, euro-area MFIs' net foreign liabilities have been falling nearly continuously since the beginning of monetary union. They have been offset not just by a dampening of the money stock and of monetary capital formation but also by an increase in credit expansion. However, the pace of outflows of funds has slackened over time, which means the € 170½ billion reduction in net foreign liabilities in 1999 was followed by a decline of only € 90½ billion in 2000.

### Monetary developments in the individual euro-area countries

#### Structure of national contributions to M3 and their counterparts at the beginning of monetary union

*National contributions to M3 quite different in terms of structure*

The in some cases pronounced heterogeneity in monetary dynamics among the individual euro-area countries was at the root of euro-area-wide developments. The varying significance of the individual components of the money stock in each nation's contributions as

well as of M3's balance-sheet counterparts is a reflection of national special features. Thus, upon entry into monetary union in January 1999, the volume of D-Mark currency in circulation accounted for a disproportionately large percentage of the total volume of currency circulating in the euro area (see table on page 45). Large foreign demand for D-Mark notes played a key role. In addition, the German contribution to M3 has been characterised by a disproportionately large share of savings deposits redeemable at an agreed notice of up to three months. The only negotiable instruments of which a significant volume was issued in Germany were short-term bank debt securities. By contrast, the share of money market fund shares/units and money market paper in euro-area holdings of negotiable instruments was comparatively minor; in Germany, repo transactions are virtually negligible.<sup>4</sup>

The situation has been different in the major euro-area countries of France, Italy and Spain. The most prominent feature of the French contribution to M3 is the very high percentage of money market fund shares/units. In France there has traditionally been a close substitutional relationship between money market fund shares/units and overnight deposits (which are not allowed to bear interest), which can readily be invested in interest-bearing, relatively liquid money market fund shares/units at short notice. In Italy and Spain, the major significance of repo transactions is a striking feature; at the beginning of 1999, both countries

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<sup>4</sup> In a repo transaction, a customer deposits funds against the temporary transfer of securities (which serve as collateral) by an MFI.

## National shares in the money stock M3 and its components

As % of the euro-area total for each component

Country/group of countries	M3	Currency in circulation	Overnight deposits	Deposits with an agreed maturity of up to two years	Deposits redeemable at notice of up to three months	Repo transactions	Money market fund shares/units and money market paper (net)	Debt securities with a maturity of up to two years (net)
	January 1999							
Belgium	5.2	3.3	3.3	7.1	8.0	0.8	0.4	19.2
Germany	28.8	38.3	25.8	27.5	40.2	0.9	10.2	19.3
Spain	11.0	15.5	7.9	13.4	7.4	40.2	14.2	0.7
France	20.0	12.9	20.0	6.1	22.2	19.8	58.7	- 2.1
Greece	.	.	.	.	.	.	.	.
Ireland	1.7	1.1	0.6	3.2	2.2	0.2	0.0	19.5
Italy	15.4	18.1	23.9	9.2	9.6	35.9	1.2	27.7
Luxembourg	4.1	0.2	3.5	9.9	0.4	1.1	11.5	- 2.9
Netherlands	6.9	5.2	7.5	6.2	9.7	0.5	0.0	12.4
Austria	2.9	3.2	2.8	8.8	0.0	0.1	- 0.2	5.1
Portugal	2.3	1.3	2.3	7.3	0.0	0.4	0.0	0.5
Finland	1.6	0.8	2.5	1.4	0.4	0.0	4.0	0.5
Euro area	100	100	100	100	100	100	100	100
	April 2001							
Belgium	4.7	3.3	3.4	6.5	7.5	0.5	0.1	10.4
Germany	26.8	35.5	26.4	26.8	35.0	0.6	13.4	32.5
Spain	10.7	15.4	8.6	14.1	8.4	30.9	6.3	6.3
France	19.9	12.3	19.3	7.0	22.2	15.7	52.5	- 3.9
Greece	2.4	2.1	0.7	3.0	3.9	12.9	0.0	0.1
Ireland	3.3	1.3	0.9	3.9	2.4	0.0	11.7	14.0
Italy	14.1	19.8	22.9	5.1	10.0	35.9	2.6	9.2
Luxembourg	4.0	0.1	3.3	8.2	0.3	0.1	11.5	- 1.3
Netherlands	7.5	4.6	7.5	9.1	9.7	3.0	0.0	21.3
Austria	2.8	3.4	2.7	7.9	0.0	0.1	- 0.1	7.3
Portugal	2.3	1.5	2.3	7.1	0.0	0.2	0.0	2.0
Finland	1.4	0.8	2.2	1.3	0.6	0.0	2.0	2.1
Euro area	100	100	100	100	100	100	100	100

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accounted for a combined 75 % of repo transactions concluded between MFIs and non-MFIs in the euro area. In Italy this was joined by a major preference for M1 components. For the most part, in the remaining euro-area countries the share of negotiable instruments was disproportionately great. In Luxembourg, in particular, money market fund shares/units played a major role, and in Ireland, but also in Belgium and the Netherlands, short-term bank debt securities were important.

There are differences among euro-area countries regarding balance-sheet counterparts, too. Relative to its national share in M3, the German MFI sector at the beginning of monetary union accounted for a disproportionately large share in euro-area lending to the private and public sector. Monetary capital formation,

which was likewise relatively high, formed the counterweight; just under half of longer-term funds deposited at banks in the euro area were held by German MFIs. This is testimony to the dominant role played by the banking system in the German financial sector. By contrast, French MFIs accounted for a relatively large percentage of lending to non-euro-area countries. Lending to the domestic private sector in Italy and Spain was disproportionately low compared to their national contributions to M3. Unlike France, they additionally recorded low levels of net external assets. In both countries, the relatively low level of assets-side business was accompanied by relatively weak monetary capital formation at MFIs.

*Differences regarding counterparts, too*

### National shares in the money stock M3 and selected counterparts \*

As % of the euro-area total for each component

Country/group of countries	M3	Total assets-side business of MFIs	of which:		Monetary capital formation
			Lending to the private sector	Lending to the public sector	
January 1999					
Belgium	5.2	3.7	3.6	8.4	2.9
Germany	28.8	38.0	39.2	34.6	49.1
Spain	11.0	7.7	8.0	8.3	3.7
France	20.0	20.4	19.4	19.0	22.2
Greece	.	.	.	.	.
Ireland	1.7	1.4	1.5	1.2	0.7
Italy	15.4	13.1	12.8	15.6	9.8
Luxembourg	4.1	1.6	1.3	2.5	-0.2
Netherlands	6.9	6.9	7.8	6.0	6.3
Austria	2.9	3.5	3.4	2.9	4.1
Portugal	2.3	1.6	1.9	0.8	0.8
Finland	1.6	1.0	1.1	0.5	0.5
April 2001					
Belgium	4.7	3.7	3.2	8.3	2.7
Germany	26.8	36.0	36.1	35.9	47.1
Spain	10.7	8.3	9.0	7.8	4.9
France	19.9	18.9	18.7	16.6	19.4
Greece	2.4	1.6	1.0	3.3	0.6
Ireland	3.3	2.5	2.0	1.8	1.0
Italy	14.1	12.9	13.3	14.2	10.3
Luxembourg	4.0	1.8	1.4	2.2	0.3
Netherlands	7.5	7.2	8.5	5.8	7.2
Austria	2.8	3.4	3.2	2.7	4.3
Portugal	2.3	1.9	2.4	0.7	1.2
Finland	1.4	1.1	1.1	0.6	0.7

\* The sum of national shares in the counterparts does not always add up to 100 %, since positions held by the ECB enter into the consolidated MFI balance sheet for the euro area. This is quantitatively important, in particular, for the net external position as an element of assets-side business and own capital as an element of monetary capital formation; at the end of 2000 the ECB held capital and reserves, including provisions and proceeds from revaluation, as well as a surplus for the year, all of which added up to € 16.6 billion.

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### Monetary dynamics in the euro-area countries since the beginning of monetary union

Since the beginning of monetary union, both the structure of national contributions and their significance to the euro-area aggregate have shifted. National special factors such as the repatriation of Euro-deposits in Germany or lasting portfolio shifts in Italy have been the hallmark of structural change in the national contributions. Besides the national special developments, differences in countries' location in the business cycle and the interest-rate sensitivity of the national contributions have been responsible for the divergence in the monetary dynamics of the euro-area countries.

*Structural shifts*

With the increase in short-term interest rates at the end of 1999, monetary growth was stifled particularly in those countries holding a relatively large share of components bearing either little or no interest, since in those cases interest-rate hikes caused a higher-than-average increase in the opportunity costs of holding money. The increase in the German, Belgian and Italian contributions was below average.<sup>5</sup> By contrast, not only the Dutch contribution but particularly the Irish contribution went up distinctly.

*Change in relative significance of national contributions due to interest-rate-related shifts ...*

<sup>5</sup> Whereas an increase in the short-term interest rate in Germany, Belgium, Austria and the Netherlands apparently helps to dampen monetary growth, it stimulates the growth of national contributions to M3 in France, Spain and Italy, at least in the short run. A comparative analysis of national contributions is contained in: Dedola, L., E. Gaiotti and L. Silipo, Money Demand in the Euro Area: Do National Differences Matter? Banca d'Italia, Temi di Discussione, No. 405, 2001.



*... and heterogeneous conjunctural situation, ...*

In addition to the development of interest rates, the heterogeneous conjunctural situation is likely to have had varying impacts on monetary growth in the individual euro-area countries. One sign is that the countries with the strongest real growth are largely also those whose national contributions have grown the fastest. Besides divergences in terms of the real economy, differences in the income elasticity of the demand for money also play a role; it is especially high in Portugal and Spain, as well as in Belgium and the Netherlands.<sup>6</sup>

*... which has also had an impact on credit development*

The conjunctural differences have also contributed to the sometimes heterogeneous development in lending to the private sector. Lending to enterprises and individuals rose more sharply than the euro-area average not only in Spain and Portugal but also, and in particular, in the Netherlands and Ireland. In both countries, a sharp rise in real-estate prices, particularly in 1999, was also partly to blame. Outflows of funds to non-euro-area countries dampened the influence on monetary growth being exerted by credit expansion, particularly in the Netherlands. Yet German MFIs' net external assets likewise declined markedly since the beginning of monetary union, reflecting, among other things, extensive purchases of foreign securities by German non-banks. By contrast, Ireland, Austria and Luxembourg recorded net inflows of funds from non-euro-area countries.

*Special developments in Germany...*

Moreover, national special developments had an influence on the varying intensity of monetary growth in the euro-area countries (see chart on page 48).<sup>7</sup> They are partly effects re-

lated directly to entry into monetary union. In Germany the euro-area-wide introduction of interest-bearing minimum reserves initially led to a massive repatriation of short-term funds hitherto invested in the Euro-market to the German banking system. Private German non-banks' short-term deposits held with foreign branches and subsidiaries of German banks went down by € 25.4 billion, or 26½%, over the course of 1999. Under the assumption that the repatriated funds have been fully reinvested in the German MFI sector in a manner affecting the money stock, repatriated Euro-market deposits would therefore account for around 2½ percentage points of the percentage rise in the German contribution to M3 in 1999.<sup>8</sup>

Since slightly less than half of the returning funds came from Luxembourg, the repatriation of private German non-banks' Euro-market deposits triggered a sharp decline in Luxembourg's contribution to M3.<sup>9</sup> At the euro-area level, monetary growth therefore did not fully reflect the repatriation of funds

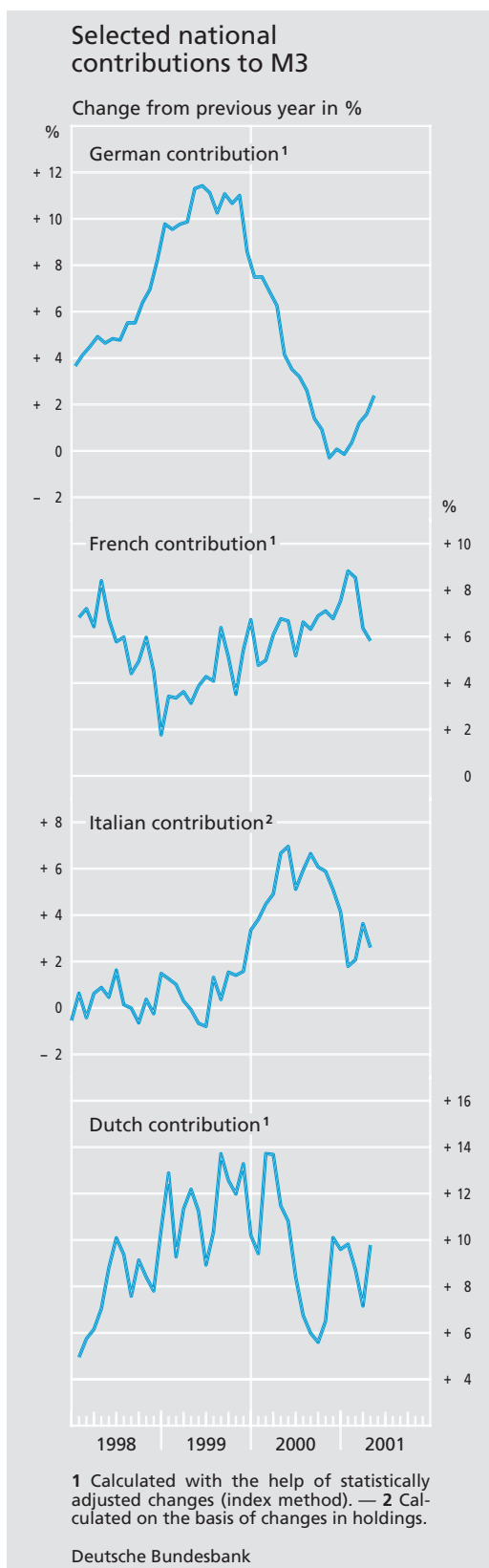
*... and in Luxembourg...*

<sup>6</sup> An overview of income elasticities for the euro-area countries estimated on the basis of country-specific money demand functions is provided in: Dedola, L., E. Gaiotti and L. Silipo (2001), op. cit.

<sup>7</sup> The term "special developments" is used to mean monetary developments which cannot be explained using traditional explanatory factors of the demand for money, i. e. interest-rate and income developments. Rather, their cause is to be found in particular in changes in the institutional framework within which money holders take their portfolio decisions (examples include changes in taxation and minimum reserve requirements as well as the emergence of financial innovations).

<sup>8</sup> The distortion given here rests on the assumption that Euro-market deposits would have stagnated in lieu of the massive repatriations, as was generally the case between 1994 and 1998, given certain fluctuations.

<sup>9</sup> In line with the definition of the national contributions to M3, German households' and enterprises' short-term deposits held with branches and subsidiaries of German MFIs in Luxembourg are part of Luxembourg's contribution to M3.



from Luxembourg. By contrast, the repatriation of Euro-market funds from non-euro-area financial centres (particularly London) led to the twelve-month rate of euro-area M3 being overstated in December 1999 by around one-half percentage point.

In 2000, the development of short-term deposits held by German non-banks at foreign branches and subsidiaries reversed itself, on balance. Whereas the reduction in deposits placed in London continued over the course of 2000, short-term deposits in Luxembourg were perceptibly increased, nearly reaching their pre-monetary union level by the end of 2000. However, this was partly due to shifts of deposits from London to Luxembourg.

The introduction of uniform minimum reserve rules in the euro area will probably have a perceptible impact on the development of other euro-area countries' national contributions to M3, too. Besides Luxembourg, where minimum-reserve-exempted longer-term bank deposits and investment forms outside the MFI sector initially benefited from the new minimum reserve requirement on short-term bank liabilities,<sup>10</sup> Italy, in particular, probably experienced a decline in shorter-term funds held with banks.<sup>11</sup> This applies, for instance, to bank debt securities with an initial maturity of two years which were recaptured by the min-

... and in Italy

**10** In 1999, the issuance of longer-term bank debt securities by Luxembourg MFIs was up quite a bit from the previous year. Moreover, deposits with an agreed maturity of over two years went up distinctly as well.

**11** See: Masuch, K, H. Pill and C. Willeke, Framework and tools of monetary analysis, in: European Central Bank (ed.), Seminar on monetary analysis: tools and applications, Frankfurt am Main, 2001 (print version due to be published shortly; an advance copy is available for download from the ECB's web site).

imum reserve. However, the decline in bank deposits in Italy had an even more significant impact. In July 1996 the tax rate for interest income from bank deposits was set at a uniform level of 27 %, placing certificates of deposit (CD) with a maturity of over 18 months – which had previously been taxed at a rate of 12.5 % – at a disadvantage. This move caused a protracted reduction in short-term CDs, which are classified as time deposits with an agreed maturity of up to two years, and in longer-term CDs, which are classified as time deposits with an agreed maturity of over two years.<sup>12</sup> Apart from the change in tax on interest income, a seismic shift in investment behaviour has taken place in Italy in the past few years, apparently due also to the lasting improvement in the outlook for stability. Longer-term bank debt securities, sales of domestic and foreign investment fund certificates, and low-interest-bearing, highly liquid overnight money all benefited.

*Overstatement  
owing to the  
purchase of  
money market  
fund shares/  
units by non-  
euro-area  
residents ...*

The aforementioned extensive purchase of money market fund certificates by non-euro-area residents benefited Irish money market funds, in particular. Available reliable data show that the lion's share of Irish money market fund shares/units in circulation is being held by non-euro-area residents, whereas the share of paper held by euro-area residents is insignificant and, in addition, is largely stagnant. Non-euro-area residents' demand is apparently also a major factor in Luxembourg's money market funds. Though that market is not as large or as dynamic as that of Ireland, Luxembourg's contribution to M3 is likely to be distorted as well.

Given all the difficulties involved in ascertaining the structure of holders of paper traded on secondary markets, the overstatement of M3 growth due to non-euro-area residents' holdings of money market paper may be just as great as that of holdings of money market fund shares/units.<sup>13</sup> At issue here is, in particular, money market paper issued by German MFIs. Several elements have contributed to the great demand for German money market paper: a general catching-up process of the securitised German money market, which had been hitherto underdeveloped; the introduction of interest on minimum reserve holdings at the beginning of 1999; and also efforts by foreign investors to find a liquid, safe investment vehicle in the run-up to Y2K. Though net sales of money market paper outside the German MFI sector were down some 80 % in 2000 from the previous year, demand on the part of non-euro-area residents for such paper remained high – whereas in the first year of monetary union issues were denominated almost exclusively in euro, in the year 2000 German MFIs, on balance, sold paper denominated solely in foreign currencies. The lion's share of such paper is apparently being held by non-euro-area residents. All in all, therefore, the distortion of the growth rate of M3 in connection with purchases of German money market paper by

*... and the  
purchase of  
money market  
paper*

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<sup>12</sup> The reduction in certificates of deposit was promoted in particular by the fact that the tax rate on interest income on bank debt securities with an initial maturity of over 18 months remained unchanged at 12.5 % (see: Banca d'Italia, Economic Bulletin, No. 23, Box "Changes in tax treatment of interest on bank deposits" and No. 25, Box "The behaviour of bank deposits and the money supply").

<sup>13</sup> See: ECB, Monthly Bulletin, May 2001, Box 1 "Measurement issues related to the inclusion of negotiable instruments in euro area M3".

non-euro-area residents is hardly likely to have decreased perceptibly.

### The significance of heterogeneity for European monetary policy

*Persistent heterogeneity*

On the whole, monetary structures in the individual euro-area countries continue to be quite heterogeneous. Though the components of M3 have gradually converged, due primarily to the sharp decline in savings deposits in Germany, the differences between the counterparts have become even greater, especially regarding external assets and external liabilities. Monetary growth, too, has varied, sometimes considerably. National contributions' rates of growth converged until spring 2000, after which the gap re-opened (see chart on page 51). That is also the case for the four largest euro-area countries (Germany, France, Italy and Spain), which together make up more than 70 % of euro-area M3.

*Heterogeneity makes interpreting monetary developments more difficult*

This heterogeneity hampers the interpretation of monetary developments in the euro area. Not only national special factors, which are often difficult to recognise and quantify, but also "traditional" influencing factors, which have varying impacts on the money stock in the individual countries, play a role. If, for instance, national M3 contributions react differently to GDP movements in their countries, and if at the same time economic growth varies among the euro-area countries, euro-area M3 can change independently of euro-area GDP. By the same token, euro-area M3 can remain constant even though aggregate GDP in the euro area has gone either up or down. In principle, the same applies to the influence of inter-

est rates. However, as far as interest rates go, differences among the euro-area countries in the long-term segment have gone down markedly as a result of the process of interest-rate convergence. Short-term interest rates, owing to their proximity to central bank lending rates and to the single money market, are nearly identical in all euro-area countries anyway.

Where pronounced differences in economic situations and in the money demand function exist between the individual countries, knowledge regarding the development of national contributions may also provide valuable information to a monetary policy committed to maintaining price stability throughout the euro area. Dedola, Gaiotti and Silipo use a simple two-country model to demonstrate that the single optimal interest rate is dependent on the level of individual national contributions and the parameters of the two national money demand functions in those cases when national output elasticities and the variance of real and monetary disturbances deviate from one another.<sup>14</sup>

Despite the heterogeneity in monetary developments among the individual euro-area countries described above, euro-area M3 is undoubtedly the key monetary variable on which the single monetary policy is oriented. Here, the European money demand function even benefits from diverging developments, owing to which it demonstrates greater stability than the individual national money demand functions of the euro-area coun-

*Yet national contributions also provide information for euro-area-wide monetary policy*

*Stability of European money demand is greater*

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<sup>14</sup> Dedola, L., E. Gaiotti and L. Silipo (2001), op. cit., Appendix I.

tries.<sup>15</sup> For one thing, this is probably attributable to intra-euro-area transactions, which are not reflected in the euro-area aggregate but which certainly have an impact on the development of national contributions, such as the German and Luxembourg contributions. For another things, the area-wide impact of changes in the individual countries' financial sectors is not as great if these changes go hand in hand with stable money demand functions in other euro-area countries. Finally, even the wholly random fluctuations in European money demand may be less forceful than those at the national level. Although this "statistical averaging effect"<sup>16</sup> is particularly evident in those cases where the countries hit by monetary shocks are alike in terms of size (of their economies), this effect is largely responsible for the greater stability of European money demand.

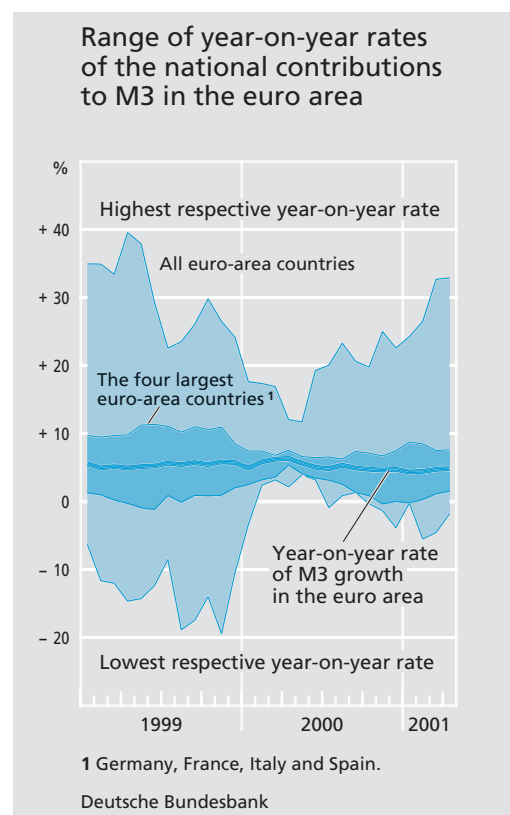
### Empirical area-wide findings

#### Overview of the literature

The stability of money demand is important for using M3 as an information variable for future price developments. In estimating an area-wide demand for money, in most cases the real demand for money ( $m-p$ ) is analysed in the long run as a function of a scale variable ( $y$ ) – both in logarithms – and one or several opportunity cost variables ( $r$ ).

$$m - p = f(y, r)$$

However, the exact shape of the specification is still the subject of dispute in the literature. This primarily concerns the question of adequately choosing and measuring the variable(s) of opportunity cost. Besides an income



variable – a wealth variable is rarely used as a scale variable<sup>17</sup> – various combinations of long-term and short-term interest rates are used, as well as, on some occasions, the spread and the inflation rate.<sup>18</sup> Owing to the

<sup>15</sup> This discussion was held primarily in the pre-monetary union stage. See, for instance, Arnold, I., Fallacies in the Interpretation of a European Monetary Aggregate, *Weltwirtschaftliches Archiv*, Vol. 132, No. 4, 1996, pages 753 to 762; Fagan, G. and J. Henry, Long Run Money Demand in EU: Evidence for Area-Wide Aggregates, *Empirical Economics*, Vol. 23, Issue 3, 1998, pages 483 to 506; and Wesche, K., *Die Geldnachfrage in Europa, Aggregationsprobleme und Empirie*, Heidelberg, 1998.

<sup>16</sup> Fagan, G. and J. Henry (2001), op. cit., page 497.

<sup>17</sup> One example is Fase, M. and C. Winder, "Wealth and the Demand for Money in the European Union", *Empirical Economics*, 1988, 23, pages 507 to 524. Portfolio approaches to explaining money demand favour taking wealth into account. However, the inadequate amount of available data is a major impediment.

<sup>18</sup> See, for instance, Coenen, G. and J.-L. Vega, "The Demand for M3 in the Euro Area", ECB Working Paper No. 6, 1999, and Brand, C. and N. Cassola, "A Money Demand System for the Euro Area", ECB Working Paper No. 39, 2000.

### Variables used in the long-run demand for money

Position	y 1	rl 2	rk 3	rm3 4	infl 5
Coenen/Vega	x	x	x		x
Brand/Cassola	x	x			
Golinelli/ Pastorello	x	x	x		
Calza/ Gerdesmeier/ Levy	x		x	x	
Dedola/Gaiotti/ Silipo	x	x	x	x	

1 y: real GDP. — 2 rl: long-term interest rate. — 3 rk: short-term interest rate. — 4 rm3: own rate of return on M3. — 5 infl: inflation rate.

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high percentage of interest-bearing components in M3, the own rate of return on M3 has latterly been more carefully formulated and taken into account.<sup>19</sup>

Using the simple difference between the long-term interest rate and the money market rate (the latter being an approximation of the own rate of return, such as in Coenen and Vega's study) implies a short-run parallelism of M3 and interest, since the raising of short-term interest rates coincides with a flattening of the yield curve. Thus, the short-term development of the money stock is difficult to interpret.

Dedola, Gaiotti and Silipo, as well as Calza, Gerdesmeier and Levy, each use the difference between long/short-term interest rates

and a (calculated) own rate of return. The first group of researchers use a single-equation approach, whereas the latter begin by using a system containing the difference between the long-term interest rate and the own rate of return and between the short-term interest rate and the own rate of return. By testing diverse restrictions, they derive a long-run money demand equation in which only the difference between the short-term interest rate and the own rate of return enters as a measure of the opportunity costs of holding money. The influence of the difference between the long-term interest rate and the own rate of return proves to be non-significant. It turns out that, by incorporating the own rate of return, the coefficient of the short-term interest rate changes its sign.

The Bundesbank's own estimates (see notes on page 54) using a model with the real money stock, real GDP, the long-term interest rate, the short-term interest rate, the own rate of return and the inflation rate as variables, have resulted in an income elasticity of 1.3, which is significantly higher than unity. Thus, the velocity of circulation is displaying a declining trend. Economic theory is rather vague

*The Bundesbank's own findings*

<sup>19</sup> See: Dedola, L., E. Gaiotti and L. Silipo (2001), op. cit., and Calza, A., D. Gerdesmeier and J. Levy, "Euro Area Money Demand: Measuring the Opportunity Costs Appropriately", 2001, mimeo. Differences also exist relating to the question of whether inflation should be included in the long-run demand for money. The fact that inflation may be a measure of the return on holding goods argues in favour of inclusion. However, the expected future rate of inflation is more likely to be relevant to holding money, and according to the Fisher hypothesis it is contained in the long-term interest rate. Moreover, it has been shown that the cointegrativeness of the money demand relationship is not lost if the inflation rate is not included (this result was reached by Golinelli, R. and S. Pastorello, "Modeling the Demand for M3 in the Euro Area", 2000, mimeo).

concerning the magnitude of this parameter. A value greater than unity indicates that money acts not only as a medium of payment but also as a store of value. For the broadly defined monetary aggregate M3, which also contains components bearing interest in line with market rates, the estimated value does not seem implausible. The semi-elasticity of the difference between the long-term interest rate and the short-term interest rate is  $-1.76$ . That means that if this interest gap widens, money holdings are distinctly curtailed – and, conversely, these holdings grow if the gap narrows. The income elasticity corresponds roughly to that of the Brand/Cassola model (for the observation period being looked at here), which, except for the own rate of return, contains the same variables, whereas the semi-interest elasticity is higher if the own rate of return is taken into account ( $-1.76$  versus  $-0.77$ ). That is a sign that the difference between the long-term interest rate and the own rate of return is a better indicator of the opportunity costs of holding money than the long-term interest rate by itself.

*Long-run  
money demand  
is stable ...*

All in all, real money demand for the area-wide broad money stock M3 has proved to be stable at the euro-area level over the long run. Therefore, M3 growth is in a sufficiently close medium to long-term relationship to real GDP growth and to the opportunity costs of holding money, which is measured in terms of the difference between the yield on ten-year government bonds outstanding and the weighted own rate of return on M3 components. Price developments in the euro area are determined to a high degree over the long run by the rise in nominal M3. The mon-

etary policy of the Eurosystem, geared to price stability, is therefore justified in attaching key importance to M3.

Over the short run, however, M3 is prone to random fluctuations which can impair its informative value. However, the error correction term of the long-run demand for money makes a significantly negative contribution to explaining the short-run demand for money; therefore, wherever disruptions occur, money holding is adjusted until a new equilibrium is created.

*... equipped  
with sufficient  
adjustment  
mechanisms for  
creating a new  
equilibrium ...*

Otherwise, M3 is sufficiently controllable. Increasing short-term rates, in addition to causing an increase in long-term rates, also cause the own rate of return on M3 to rise. However, since the increase in the own rate of return is disproportionately low due to the presence of non-interest-bearing components, the opportunity cost of holding money increases, on balance, during the phase of interest-rate increases.

*... and suffi-  
ciently control-  
lable*

The price gap, or – as the ECB calls it, the real money gap – can be calculated on the basis of the estimated money demand equation. This gap shows the future inflation pressure being exerted by the current (real) balances. Both concepts show the percentage deviation of the real money stock from its long-term equilibrium value.<sup>20</sup> The further the actual money stock exceeds its equilibrium value,

*Price gap  
currently giving  
the "all clear"  
sign regarding  
inflation  
dangers*

<sup>20</sup> The concept of the price gap was already discussed at length in the January 1992 Monthly Report (see Deutsche Bundesbank, Monthly Bulletin, January 1992, page 24ff.). For the ECB's calculation of the real money gap see European Central Bank, Monthly Report, May 2001, page 48 ff.

## Estimating the demand for money in the euro area

The definition of money used here is M3. The index series published by the ECB is used here in order to rule out the possibility of statistical distortion; it is not adjusted for money market fund shares/units held by non-euro-area residents. Real gross domestic product is used as the scale variable; the GDP deflator is used to measure the price index. Both variables are seasonally adjusted. They are based on data provided by Brand and Cassola and based on ECB revisions. The yield on ten-year government bonds outstanding is used as the long-term rate, and three-month money market interest rates are used as the short-term rate. The own rate of return corresponds to a weighted interest rate in which the national interest rates of the components are weighted using their share in the M3 aggregate. A distinction is made between three types of components: currency, bank deposits and negotiable instruments. For negotiable instruments, the three-month money market rate is assumed to be the interest rate. The data used are quarterly data between the first quarter of 1983 and the fourth quarter of 2000.

In the following text, we will look at a system consisting of the real money stock ( $m-p$ ), real GDP ( $y$ ), the real long-term interest rate ( $rl$ ), the short-term interest rate ( $rk$ ), the own rate of return on M3 ( $rm3$ ) and the inflation rate. Since some series show patterns akin to trends, an unrestricted constant, i.e. a drift term, is assumed in the VEC model. The Johansen procedure analyses the question as to whether stationary long-run relationships exist, since the individual time series each contain a unit root. The lag order  $p$  is defined such that the residuals are not autocorrelated, which, in this case, means  $p = 2$ . The number of cointegration relationships  $r$  is determined using the Trace test. This test points to four stationary long-run relationships given a 5 % margin of error (see table).

Trace test

r	Trace test	Critical value
0	115.10	94.15
1	85.19	68.52
2	57.26	47.21
3	32.15	29.68
4	13.38	15.41

By means of tests using various parameter restrictions, a money demand equation, term structure equation, Fisher equation and an equation for the correlation between the short-term interest rate and the own rate of return are identified. The corresponding residual restrictions cannot be rejected (LR-test = 6.71, p-value = 0.15).

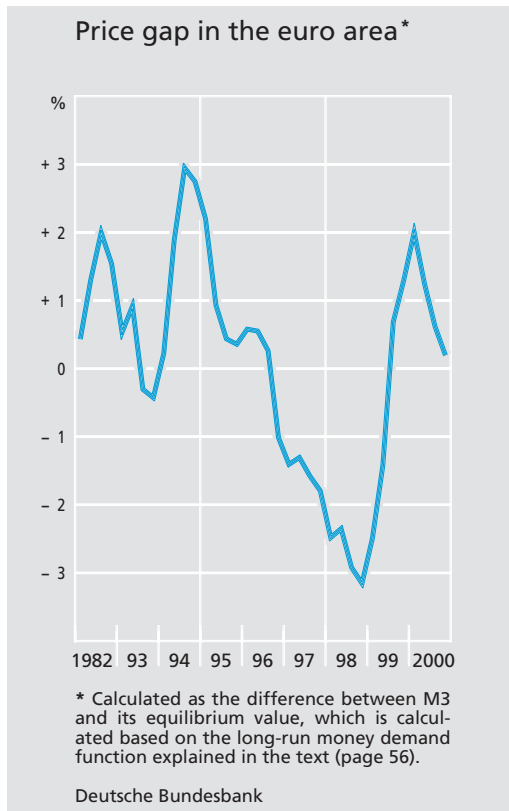
The resultant long-run money demand function is

$$(m-p)_t = 1.30 y_t - 1.76 (rl - rm3)_t$$

In the short-run equation for the development of the money stock, the adjustment coefficient of the error correction term of money demand is  $-0.09$ , and the corresponding t-value is  $-4.25$ . The test for weak exogeneity implies that the remaining variables are weakly exogenous to the parameters of money demand (LR-test = 9.73; p-value = 0.37).

The money stock is controllable through short-run dynamics and long-run equilibrium relationships between the long-term and short-term interest rates (coefficient: 1.00) and between the short-term interest rate and the own rate of return (coefficient: 0.62). The Hansen and Johansen recursive test indicates stability of the estimated long-term equilibrium relationships.





the greater future price increases will be. The equilibrium money stock is derived on the basis of the money demand function, into which potential output (as equilibrium GDP) and an equilibrium interest differential are in-

serted. The underlying potential output is derived from the GDP values used here with the help of a Hodrick-Prescott filter. The prevailing interest-rate situation has been assumed to be in equilibrium for simplicity.

According to these calculations, a price gap formed, especially in 1999. Monetary growth outpaced its path of equilibrium. Afterwards, the price gap largely closed; monetary growth decelerated, and part of the preceding sharp growth in the money stock was eaten up by stronger-than-expected price increases. Inflationary pressure owing to excessively large money holdings no longer exists. Given all the methodological differences which must be observed when comparing individual empirical studies, the results of ECB analyses are borne out here, too.<sup>21</sup>

<sup>21</sup> For calculating the real money gap, the ECB does not use a money demand function, but instead assumes an (equilibrium) nominal money supply growing at the rate of the reference value of 4 ½ % and subtracts from it the deviation of prices from the price stability definition of "less than 2 %".