ISBN 92-64-02988-5
OECD Economic Surveys: Euro area

Chapter 2

Monetary policy*

Inflation has been well anchored around but slightly above 2% despite large increases in energy prices. Rising energy costs are putting pressure on the prices of a wide range of goods and services but the feed-through has been muted compared with past oil shocks. The ECB has been removing monetary accommodation to address risks to price stability now that the recovery is on a surer footing. The pace of tightening has been influenced by what it sees as significant medium-term risks to price stability, although there are downside risks as well such as the possibility of a disorderly unwinding of global economic imbalances. Its risk assessment is influenced by the recent strong growth in money and credit aggregates, although there are questions about how reliable they are as guides for policy.

Monetary policy is made more difficult by wage stickiness and inflation inertia. Greater labour market flexibility and more competitive financial and product markets would help speed up the transmission of monetary policy and reduce cyclical divergences across the euro area.

* This chapter is based on information up to 29 November 2006.

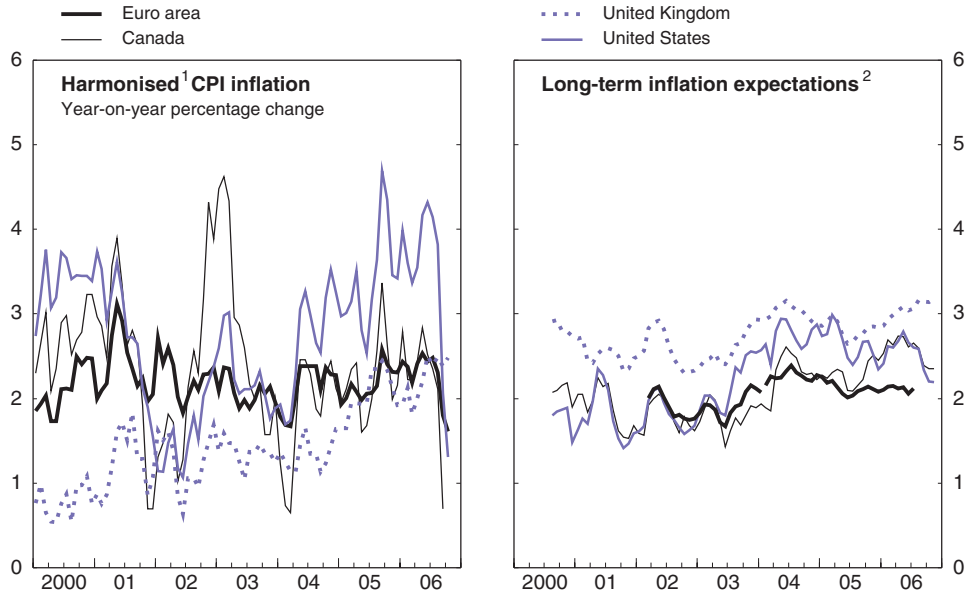
The monetary stance

Inflation has been slightly above target for some time

By international standards, inflation has been remarkably stable, moving in a narrow corridor around 2% over the past six years (Figure 2.1). It picked up through 2006 to peak at 2.5% mid-year but fell back below 2% in September. The increase is largely due to energy prices, which have directly added around a percentage point to inflation in 2005 and 2006 (Figure 2.2). Over the same period, indirect taxes and administered prices have contributed around 0.4 percentage point, and Germany's value-added tax (VAT) increase is expected to add around another ¼ percentage point in 2007.

Higher energy costs are beginning to push up prices throughout the economy as they work their way through the production chain. Most measures of core inflation have picked up from around 1½ per cent in early 2005 to around 2% at present (Table 2.1). Industrial producer prices are also warning of future retail price increases (Figure 2.3). The energy component of producer prices has been soaring for some time, and most other components picked up earlier in 2006. World metal prices are at a 30-year high, driven by strong demand from emerging economies and higher production costs for energy-

Figure 2.1. **Inflation has been comparatively stable**



1. Harmonised CPI for the euro area and the United Kingdom.
2. Canada, United Kingdom and United States: based on bond yield differentials between government benchmark bonds (10-year) and inflation-indexed bonds. Euro area: based on bond yield differentials calculated by Agence France Trésor before February 2004 and on one-year forward break-even inflation rate four years ahead calculated by the ECB since February 2004.

Source: ECB; Datastream and OECD, *Main Economic Indicators* – OECD online database.

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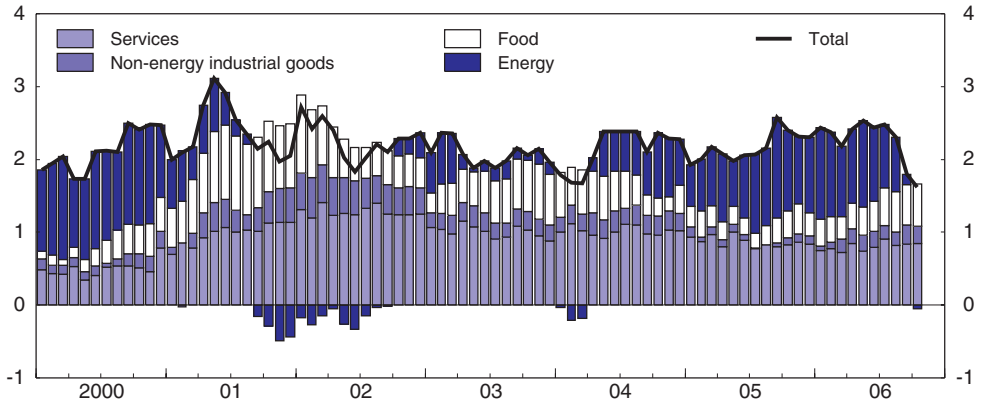
Figure 2.2. **Contributions to inflation**

Year-on-year percentage change



Source: Eurostat.

Table 2.1. **Measures of inflation**

Year-on-year percentage changes

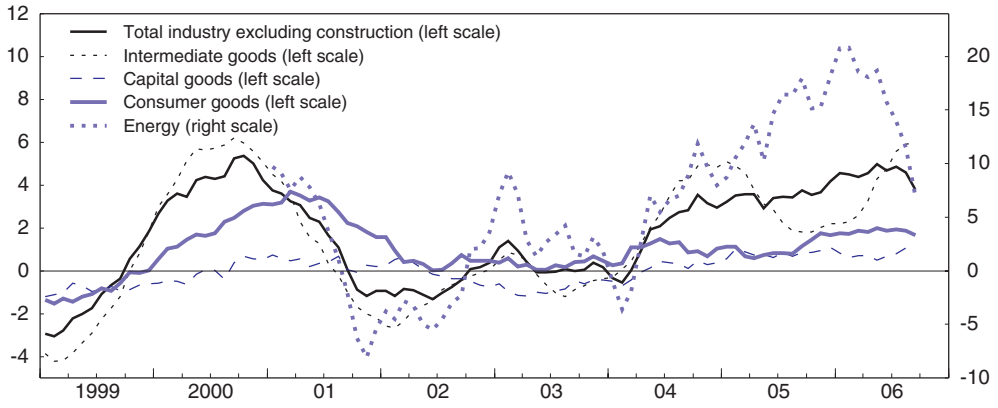
	2003	2004	2005	2005	2006									
	Dec.	Dec.	June	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Headline HICP	1.9	2.3	2.1	2.2	2.4	2.3	2.2	2.5	2.5	2.5	2.4	2.3	1.7	1.6
HICP excluding energy and unprocessed food	1.9	2.1	1.4	1.4	1.3	1.3	1.5	1.6	1.5	1.6	1.6	1.5	1.5	1.6
HICP excluding energy, food, alcohol and tobacco	1.6	1.9	1.3	1.3	1.2	1.2	1.3	1.5	1.4	1.4	1.5	1.4	1.5	1.5
Weighted median	1.9	1.8	1.6	1.8	1.8	1.9	1.9	1.9	2.0	2.1	2.1	2.0	2.1	2.1
5% trimmed mean	1.9	1.6	1.6	1.9	2.0	2.0	1.9	2.0	2.1	2.2	2.2	2.1	2.0	2.0
15% trimmed mean	1.9	1.6	1.5	1.7	1.8	1.8	1.8	1.8	1.8	1.9	2.0	2.0	2.0	2.0
Huber-type skipped mean	1.9	1.6	1.5	1.6	1.6	1.7	1.7	1.7	1.7	1.8	1.8	1.9	1.9	1.9
Volatility-weighted mean	1.5	1.2	1.1	1.4	1.4	1.4	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Double-weighted mean	1.8	1.7	1.5	1.6	1.7	1.7	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9
Proportion of price rises above 2% (in per cent)	41	45	44	49	46	52	46	46	46	50	51	49	46	49

Source: Eurostat and OECD.

intensive metals such as aluminium and steel. The latest business surveys also point to heightened price pressures. The rise in input prices and expected selling prices for services has been particularly noticeable since late 2005. On the other hand, world oil prices have fallen sharply since July 2006 and, if sustained, this will lead to significant downward pressure on the HICP in coming months. Petrol prices at the pump have already fallen by nearly 10% between July and October.

Inflation expectations are well anchored (ECB, 2006a). Bond prices imply that financial markets expect inflation to remain around 2% over the medium-term. Longer-term inflation expectations have been more stable in the euro area than elsewhere, which can be taken as a vote of confidence in the ECB (Figure 2.1). Inflation expectations of households have increased slightly, and this should be watched closely as it may signal upcoming wage pressures. Although a couple of relatively high wage deals have grabbed headlines in Germany, these are the exception rather than the rule. Overall negotiated

Figure 2.3. **Industrial producer prices**
Year-on-year percentage change



Source: Eurostat.

wages are still growing at a modest pace (Figure 1.3). Moreover, firm profitability is high enough that companies should be able to absorb some wage pressure without passing it on to prices.

What is core inflation telling us?

Measures of core inflation aim to strip out large one-off price movements to get a better gauge of inflation pressures more broadly. Some central banks look at core inflation arguing that it is a good predictor of future headline inflation, although the ECB has been more circumspect in this regard. Most measures of core inflation fell steadily from 2002 to mid-2005 as a result of weak activity, but the majority has increased by around half a percentage point since then. On balance they suggest that underlying inflation lies somewhere between 1½ and 2% (Table 2.1). The main exceptions are the exclusion-based measures, such as the HICP excluding energy and unprocessed food, which have remained low. However, these are the least useful predictors of future inflation (see Annex 2.A1) and have been distorted by factors such as a decline in clothing prices imported from Asia.[1]

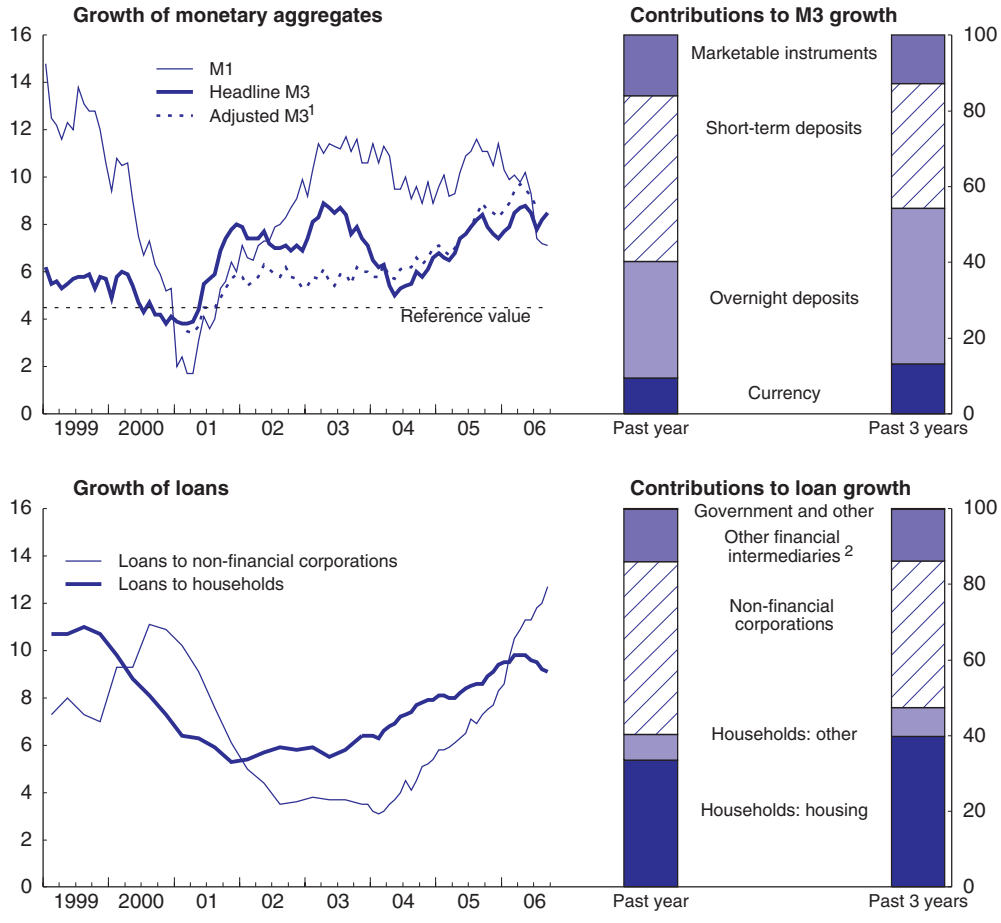
This raises the question of what will happen to inflation when energy prices stabilise: will headline inflation revert back towards core or will core move towards the headline rate? Some commentators have argued that core inflation tends to lag headline inflation, largely because it appeared to do just that around the turn of the millennium. However, anecdotal evidence can be misleading. That episode is explained by a strong economic rebound and a rise in oil prices occurring at around the same time. The link between headline and core inflation is assessed in Annex 2.A1. The main conclusion is that feedback works in both directions, but the extent to which headline reverts back towards core is about four times stronger than the reverse link and is considerably quicker. A jump in headline inflation caused by an oil price shock will push up core inflation around nine months later – indeed, this has been happening in the euro area recently – but the headline rate is likely to fall back to the (slightly higher) core rate once energy prices stabilise.[2]

Recent trends in monetary and credit aggregates

Growth in broad money (M3) peaked at nearly 9% at an annual rate in May 2006 (Figure 2.4) and, having eased back a little in mid-year, strengthened again in the northern autumn of 2006. M3 growth has exceeded the ECB's reference value of 4½ per cent almost continuously since the euro was adopted. Narrow money (M1) is responsible for more than half of the growth in M3 over the past three years, with currency in circulation accounting for 15% of M3 growth, twice its weight in the index. The demand for € 500 notes has been particularly strong. The ECB estimates that 10 to 20% of euro banknotes are circulating outside the euro area (ECB, 2006b), some of which is no doubt related to criminal activity and the underground economy.[3] Overnight deposits have been responsible for a little under half of M3 growth over the past three years. In the ECB's view, strong growth in transaction balances points to risks to price stability over the medium-term. On the other hand, it estimates that nearly three quarters of the M1 growth in 2005 can be explained by the low level of interest rates. Thus, as interest rates increase, the demand for M1 may evaporate as quickly as it grew as people shift their portfolio towards higher-yielding assets. Indeed, the growth rate of M1 has fallen substantially over the

Figure 2.4. **Money and credit growth have picked up**

Per cent



1. M3 adjusted for estimated impact of portfolio shifts.
2. Including insurance corporations and pension funds.

Source: ECB.

past few months (Figure 2.4). On the counterparts side, the driving forces behind M3 are associated with stronger demand for loans by households and firms.

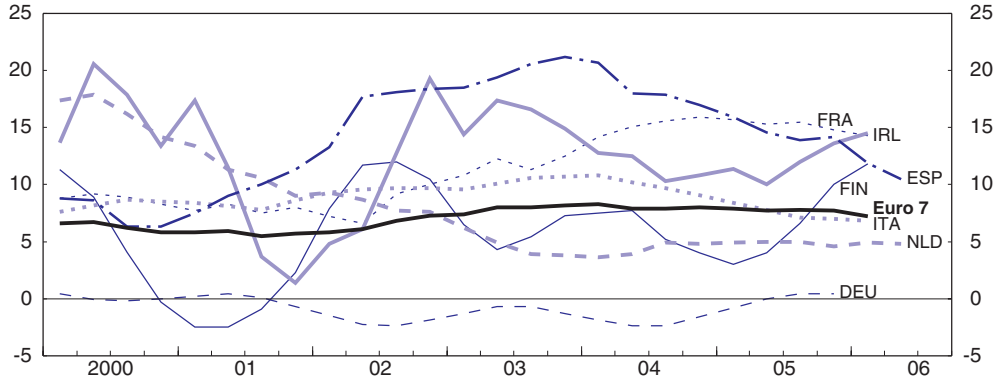
On the other side of banks' balance sheets, credit growth has picked up to rates above 10%. This is a similar pace to the US, Canada and the UK. Over the past three years loans to the private sector have increased by 26%, around half of which is mortgage lending to households. The rise in corporate loans has been strong, outstripping business investment. In large part this is due to balance sheet restructuring as firms substitute bank credit for other types of finance. Equity issuance is barely expanding and recent M&A transactions have been settled in cash rather than through swapping equity.[4] Thus, total external firm financing is growing more slowly than bank loans.

House prices have risen briskly in some countries but are slowing more recently

The ECB has put increased emphasis on the housing market when explaining its recent policy decisions. It has stressed the effect of low interest rates on asset markets in general and housing in particular. In real terms,[5] euro area house prices have increased by 30% since 1999, ranging from an increase of 80% in Spain to a decrease of 14% in Germany. Differences across countries reflect different growth dynamics and cyclical positions, but they are also influenced by country-specific structural and demographic factors. The link between credit, the housing market and activity tends to be stronger in countries with a larger owner-occupied sector, variable rate mortgages, high loan-to-value ratios, more housing-equity withdrawal and more generous tax breaks for housing (OECD, 2005b). The average increase for the euro area as a whole[6] has not been particularly high by international standards, with prices growing by around 7% per annum over the past three years (Figure 2.5).[7] The question of the appropriate monetary policy response to (area-wide) house price developments is discussed later in this chapter.

Figure 2.5. **House price growth varies widely across the union**

Year-on-year percentage change



Source: Update of series reported in Girouard, N. *et al.* (2006), "Recent House Price Developments: the Role of Fundamentals", *OECD Economics Department Working Papers*, No. 475.

Monetary conditions have tightened

Having maintained short-term interest rates at the historically low level of 2% from June 2003 until December 2005, the ECB has been withdrawing monetary stimulus in response to heightened inflationary pressures and increasing evidence of an economic

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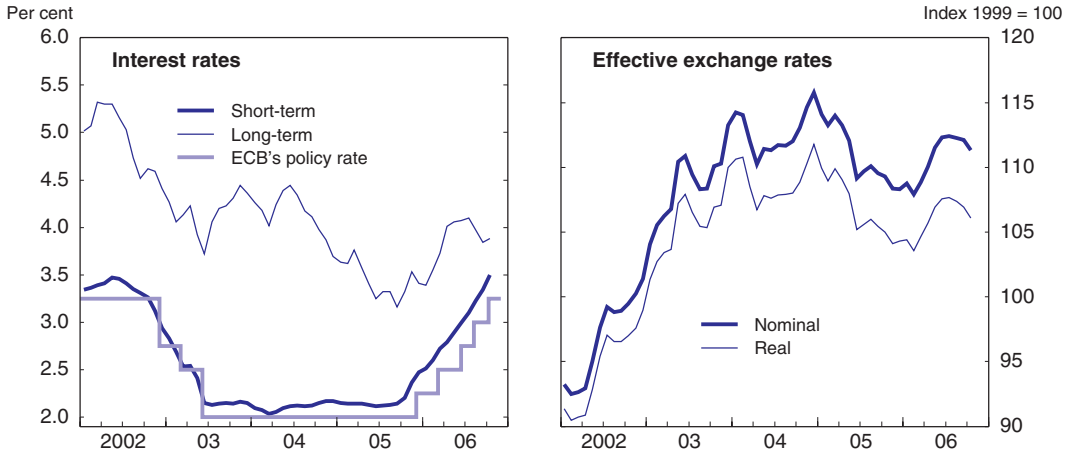
recovery. It has raised its policy rate in five steps by a total of 125 basis points. The level of interest rates remains at the lower bound of most estimates of the neutral rate, so monetary policy is still supporting activity. Long-term interest rates have risen by 70 basis points in 2006, partly on the back of short rates but also as a result of a global re-pricing of risk. Financial markets are pricing in at least another 25 basis point increase in rates over the next three months. This is realistic as the ECB has made it clear that monetary stimulus will continue to be removed so long as the recovery broadens and no major negative shocks push output or inflation off course.

A rising euro has also contributed to the tightening of monetary conditions (Figure 2.6). The currency has appreciated by 2.8% in effective terms since the start of 2006, most noticeably against the US dollar and the yen (by 11% and 9% respectively) but has been comparatively stable against the pound. The real effective exchange rate is close to its average through the 1990s, and should not be a major concern for the economy yet. However, a substantial further appreciation would put the export sector under pressure.

Figure 2.6. **Monetary and financial conditions have been tightening**



Source: ECB, *Monthly Bulletin* and OECD, *Main Economic Indicators* – OECD online database.

The short-term outlook for inflation depends on energy prices. Some modest inflationary pressures are probably still in the pipeline as past shocks work their way through the economy, although the recent slide in oil prices should help. Inflation in 2007 will also get a push from the VAT increase in Germany. Given that this is one more in a long list of shocks that have kept inflation above 2%, the ECB needs to act in a manner that preserves the credibility of its commitment to maintain price stability, especially by guarding against second round effects. Keeping longer-term inflation expectations well anchored at levels in line with its price stability objective is crucial in this respect. In any event, the effects of the oil and VAT hikes will wane after 18 months or so. After that, the underlying drivers of inflation can reassert themselves. Foremost amongst these is the large amount of economic slack in the economy. The output gap could pull down inflation by 0.5 to 1% over the next couple of years, with the latest OECD projections suggesting that the output gap will not be fully closed until 2008. However, the downward impact of economic slack would be less if the pace of the recovery is brisk enough that the economy hits speed limit effects or if the response of inflation to output gaps is highly asymmetric

(as argued in Cournède *et al.*, 2005). A second factor holding down inflation is cheap imports. International competitive pressures and technical progress have been keeping a lid on import prices for goods and services as diverse as clothing and footwear, ICT equipment and back office service functions. The *direct* effect of imports from China and dynamic Asia is estimated to have shaved at least 0.3 percentage point off the inflation rate in recent years.[8] The total effect is likely to be larger as low import prices also put a lid on prices of locally produced substitutes. These downward pressures are expected to continue for the next few years at least (OECD, 2006).

In the ECB's view, the risks to inflation over the medium-term are skewed to the upside. This has influenced the timing of its withdrawal of monetary stimulus. The upside risks include possible wage pressures due to a tightening labour market and potential feed-through of the energy price shock, an up-tick in inflation expectations and buoyancy in the housing market. At medium to longer horizons, the monetary analysis also points to upside risks to price stability. On balance, the forecasts of the OECD in *Economic Outlook* No. 80 are more benign, especially at longer horizons, due to the medium-term upside risks being counterbalanced by downside risks stemming from uncertainty about the weight of economic slack, high levels of unemployment and the continuing impact of globalisation on import prices.

Global imbalances may adversely affect the euro area

One of the more important risks facing the euro area economy is a disorderly unwinding of global imbalances. The US current account deficit was running at about 6.6% of GDP in the first half of 2006, implying that the US absorbs around three-quarters of the world's savings that are not invested at home. Cumulative current account deficits since 1990 have resulted in the United States swinging from being a net lender to a net borrower on global markets. Since 2000, however, the debt increase has been fairly mild because, at least up until September 2006, capital gains on offshore assets have offset the unprecedented size of the deficits (Table 2.2). In contrast, the euro area current account has been close to balance over the same period but its net liability ratio has risen by the same amount as in the US because it has made capital losses and has paid out more on its foreign liabilities than it has earned on its foreign assets.

Table 2.2. **Change in net foreign assets**

Per cent of GDP, 2001-04

	Initial NFA (2000)	Change in net foreign assets	Cumulative current account		Other factors			NFA in 2004
			Cumulative trade balance[1]	Cumulative investment income	Growth	Capital gains	Other[2]	
Australia	–52.2	–17.2	–7.5	–11.4	14.6	–11.4	–1.5	–69.4
Canada	–4.8	–5.7	18.5	–9.7	1.7	–15.2	–1.0	–10.5
China	–4.2	12.2	13.2	–3.1	. .	. .	. .	8.0
Euro area	**–9.8**	**–5.6**	**3.9**	**–2.3**	**1.4**	**–9.0**	**0.4**	**–15.4**
Japan	24.3	14.5	5.0	6.8	0.3	3.7	–1.2	38.8
United Kingdom	–3.7	–9.1	–15.3	7.4	1.0	–2.9	0.6	–12.8
United States	–16.7	–5.8	–19.8	1.0	3.9	10.1	–0.9	–22.5

1. Balance on goods, services and current transfers.
2. Errors and omissions plus capital account transfers.

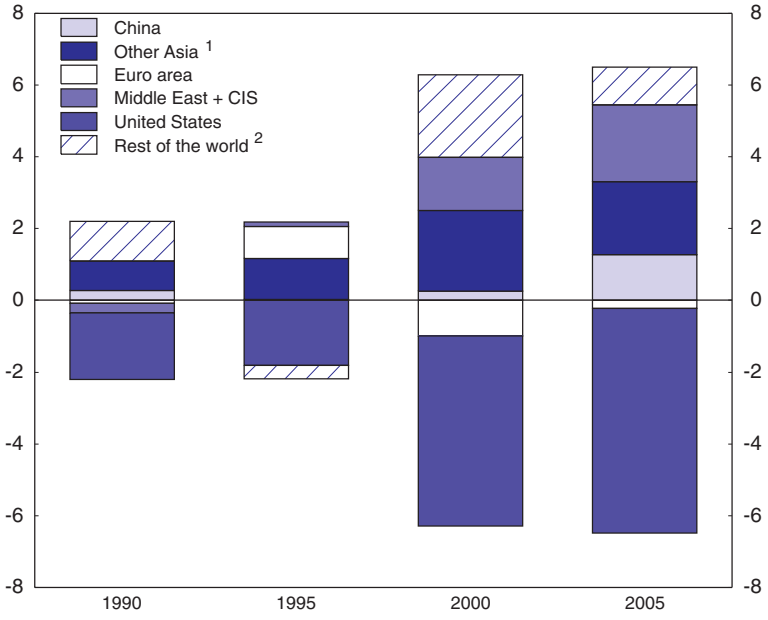
Source: Lane, P.R. and G.M. Milesi-Ferretti (2005), "A Global Perspective on External Positions", *IMF Working Paper*, WP/05/161.

There are several ways to look at the rise in the US current account deficit. In most cases it is clear that the euro area is not the main counter-party. Global imbalances appear to be an issue primarily between the United States on the one hand and dynamic Asia and the oil exporters on the other (Figure 2.7). Some of the causes are highlighted below (see Jarrett, 2005).

- *The US investment boom*. Until the late 1990s, the rise in the US current account deficit was driven mainly by a surge in investment associated with the dotcom boom, exacerbated by a falling household saving rate (Figure 2.8). A rise in US investment has also contributed in the past two years. In contrast, the euro area investment rate has been relatively stable for more than a decade.
- *Rising net savings in the developing world*. The investment rate in the Asian tigers collapsed after the 1997 financial crisis while the saving rate stayed approximately unchanged. In China and the rest of developing Asia, investment has risen by around 10% of GDP since 2000 but the saving rate has increased by more. More recently, oil exporters have sharply increased their saving rate following the surge in oil prices. The increase in savings relative to investment has driven down global interest rates, which in turn has reduced saving, boosted investment and sparked house price booms in the developed world. One puzzle is why the United States rather than the euro area has received most of the excess global savings. Part of the answer may be that the euro area is a less attractive investment location at the margin due to its underlying structural and demographic problems. But exchange rate policies focussed on US assets have surely contributed. Asian central banks have been accumulating foreign exchange reserves at an unprecedented pace, and by August 2005 held around two-thirds of world reserves

Figure 2.7. **Global current account balances**

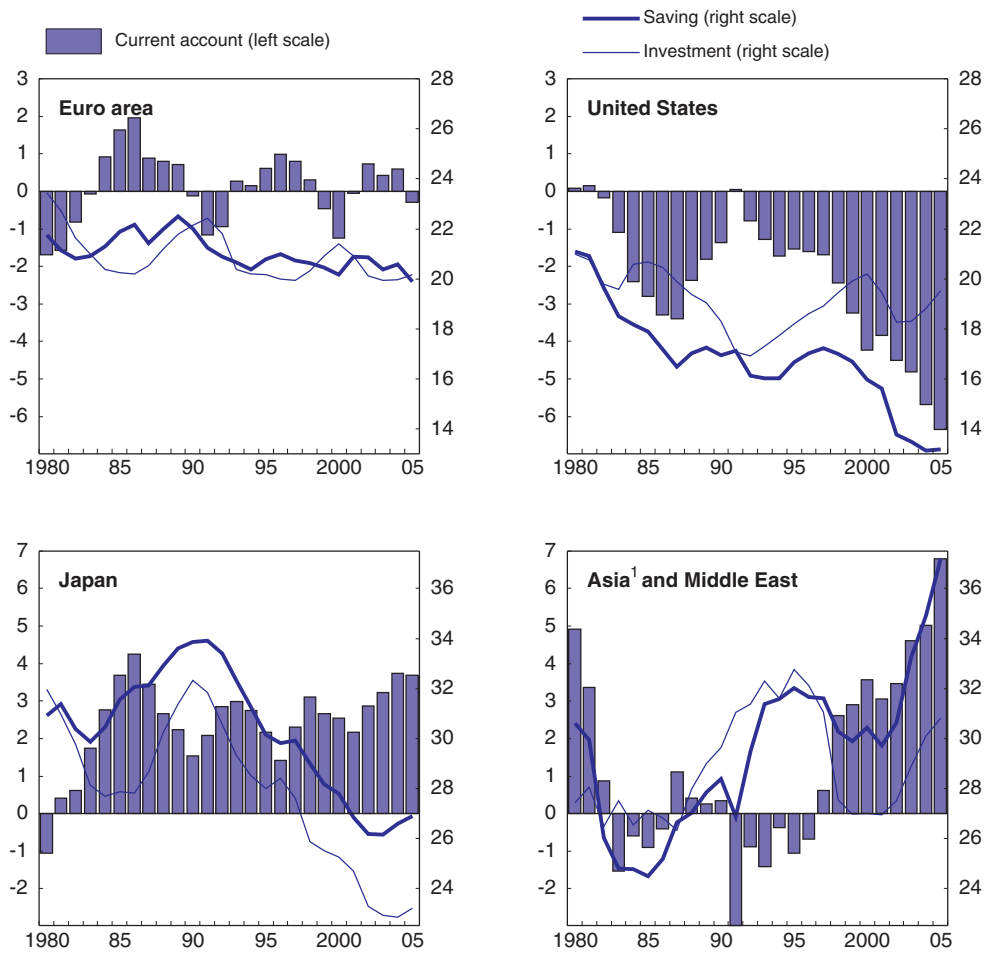
In per cent of world trade



1. Developing Asia + Newly Industrialised Asia + Japan – China.
2. Including statistical discrepancy.

Source: IMF, *World Economic Outlook* database, September 2006 and OECD (2006), *OECD Economic Outlook: Statistics and Projections* – online database.

Figure 2.8. **Saving and investment**
In per cent of GDP



1. Excluding Japan.

Source: IMF, *World Economic Outlook* database, September 2006 and OECD (2006), *OECD Economic Outlook: Statistics and Projections* – online database.

(ECB, 2006c), far more than needed to insure against a currency crisis.[9] They are doing so to hold down their exchange rates as part of an export-led growth strategy. These funds have gone disproportionately to the United States. The US dollar remains by far the preferred currency, accounting for two-thirds of global reserves (ECB, 2006). There has been an increase in the share of official reserves held in euro-denominated assets (to 24%, up from 18% in 1999), though most of this is due to valuation effects rather than higher flows. This pattern reflects the greater breadth, depth and liquidity of US fixed income markets, the fact that European financial markets are far from fully integrated, and the greater underlying strength of the US economy.[10]

- *Declining savings in the United States*. Savings patterns have differed between the euro area and the United States: in the 1990s, the household saving rate declined by almost exactly the same amount (5 percentage points) in each region but since 2000 the euro area saving rate has been relatively stable while the US rate has fallen further due to the housing boom and possibly also because forward-looking households may be

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consumption-smoothing in the face of a positive productivity shock. On the surface, therefore, it appears that savings behaviour by households in the euro area has not contributed to global imbalances, but they could have helped absorb excess global savings if retail financial markets had been more competitive and if microeconomic reforms had given them more confidence about their future income prospects. The pattern of public savings since 2000 has mirrored private savings, falling by more in the United States (5 percentage points) than in the euro area (1 percentage point).[11] Euro area governments have no room to reduce public savings further.

- *A reduced home bias*. A reduction in home bias worldwide could widen current accounts, at least while portfolios are adjusting. A reduction in home bias among non-US investors relative to US ones would lead to a portfolio diversification process that could help finance the US deficit. But that raises the same issue as above, namely why is Europe missing out? A possible answer could be that an inflow from developing Asia or the oil exporters was being offset by an outflow as euro area investors attempt to diversify their portfolios.[12] However, the evidence for European investors is that the home bias has been replaced by a euro bias and the United States and the United Kingdom have remained the dominant source for both inflows and outflows.

The euro area current account is close to balance, broadly where it should be given its relative age structure (Box 2.1). But while it is not contributing to global imbalances, even bystanders can be hurt in the crossfire. With more than one cause behind the imbalances, there is more than one way they could unwind. An orderly adjustment would require most of the driving forces to reverse direction: the US fiscal deficit falls and private savings rise, perhaps as house prices stabilise; inflation in China picks up; investment in the rest of Asia recovers, or they adjust their savings to their lower trend growth rate; the US dollar depreciates, boosting US exports; and productivity growth rates in the developed world converge. The broader the adjustment, the less damaging will be the impact on the euro area. In contrast, a disorderly adjustment involving a hard landing for the US dollar could be more worrying. At some point foreign investors will become less willing to accumulate assets whose value is expected to decline, and we may be seeing the first signs of this in 2006. Ultimately, the case for the optimists hinges on the presumption that a sudden sell-off of the US dollar is unlikely because its deficit is not being financed by hot money. Rather, capital inflows are dominated by official reserve purchases, oil reserve funds and equity capital. Moreover, the excess saving is coming from a diverse group of countries and they are likely to adjust at different times and speeds.

No matter how the adjustment takes place, the euro area will face weaker US demand for its exports. This should be offset by an increase in demand from Asia.[13] The overall growth impact will depend on the extent to which Asian exchange rates adjust relative to the US dollar[14] and how much room the ECB has to loosen monetary policy. The relative magnitude of these effects is difficult to estimate. Keynesian income-flow models such as OECD INTERLINK tend to find that a depreciation of the US dollar will be bad for the euro area because the decline in US demand for the euro area's exports exceeds the stimulus from looser monetary policy (OECD, 2005a). However, the interest-rate effects in this model are probably too weak, and in any case income flow models are not the right tool for this type of analysis: in effect, a portfolio shock is being imposed on a model where portfolios play essentially no role. Other models with a richer array of transmission channels find smaller adverse effects on the euro area (EC, 2005) or even that an orderly adjustment could raise growth in the euro area even if Asian currencies stayed pegged to the US dollar (Faruqee *et al.*, 2005; IMF, 2005b).[15]

Box 2.1. **Whose current accounts are out of line?**

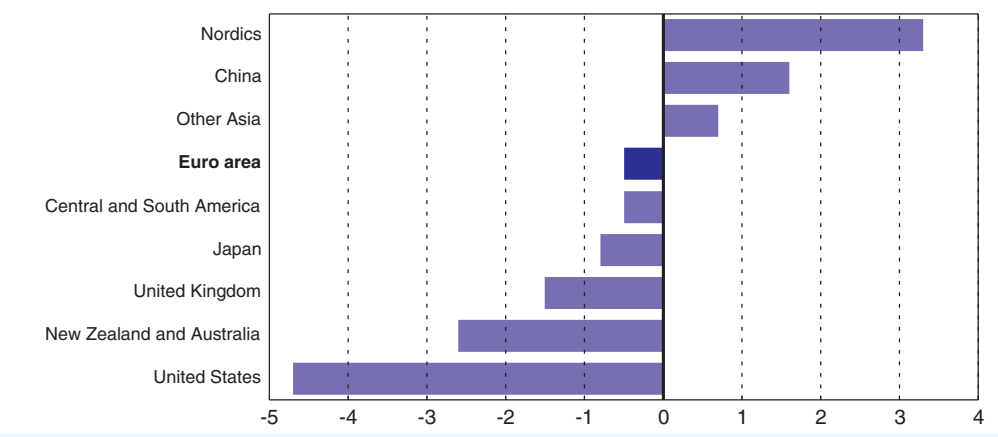
From a global point of view, the most striking anomaly is that in recent years capital has been flowing the "wrong way". Textbook theories predict that capital should flow from rich countries, where capital is abundant and labour is scarce, to poor countries where the opposite is true and where, because of the law of diminishing returns, the rate of return to capital should be greater (Lucas, 1990). The counterpart of this flow should be current account deficits in the developing world and surpluses in the industrialised nations, but we see the opposite in the world today. One explanation is that the rate of return to capital in emerging countries has actually been *lower* than in the G7 (IMF, 2005a). Poor policies and structural problems have cancelled out the advantage they should have in attracting global savings. And given the productivity surge in the United States, it may be more accurate to think of it as a "still developing" country rather than a mature, developed economy in which growth should be slowing down.

Current account positions are determined by many factors, at least in the short-term. These range from structural differences across economies such as demographics and the level of development to policy driven factors such as changes in the fiscal stance. Gruber and Kamin (2005) model current account balances using pooled data for 61 developed and developing countries from 1983 to 2003. Among other things, they find that a surplus will be higher (or a deficit lower) if: *i)* per capita income is higher (the effect described in the previous paragraph); *ii)* the fiscal surplus is higher; *iii)* there are more middle aged families, as young people and the elderly tend to dis-save; *iv)* the economy is more open to international trade; and *v)* institutional settings such as property rights and the rule of law are worse, because they become less attractive for foreign investors. Their model predicts a small surplus for the euro area and deficits in Australia and New Zealand. But it also predicts a surplus in the United States, essentially because its higher per capita income, which should put it in surplus, is large enough to offset its higher growth rate and its fiscal deficit. No variation of their model was able to "explain" the ballooning US deficit. The large surpluses in developing Asia were partly caused by the investment slump following the 1997 financial crisis.

The difference between the actual and predicted current account positions is one measure of "imbalances" – the extent to which current accounts appear to be out of line with fundamentals. According to their model, the euro area surplus over that period was around 0.5% of GDP smaller than expected (Figure 2.9). Deficits are larger than expected in the US, Japan and Australasia, while surpluses are larger than predicted in the Nordic countries and China.* All in all, this model suggests that the euro area is not making a significant contribution to global imbalances.

Figure 2.9. **Whose current accounts are out of line?**

Difference between actual and predicted current account balance, 1997-2003



Source: OECD calculations based on the econometric model of J. Gruber and S. Kamin (2005), "Explaining the Global Pattern of Current Account Imbalances", *International Finance Discussion Papers*, No. 846, November.

* The pattern of residuals shown in Figure 2.9 for the 1997-2003 period is positively correlated with actual current account balances. This suggests some mis-specification. It may be that increased globalisation (specifically, larger gross net foreign asset positions) has magnified the impact of the determining factors on the current account – *i.e.* the elasticities may have risen over time.

The main scenario in which the euro area could get hurt would be if a sharp fall in the US dollar was combined with a rise in long-term interest rates throughout the world. A reduction in global savings-investment imbalances will almost inevitably require an increase in global real interest rates over the medium-term. Simulations suggest that in this scenario growth in the United States and emerging Asia would fall sharply while the decline in growth in the euro area would be minor. The main transmission channel may be *via* a levelling off or a fall in house prices combined with a reduction in construction activity. But if these effects are not too large, they may actually be helpful for the euro area by taking some of the steam out of property driven economic booms in a couple of countries, thereby reducing cyclical divergences. Moreover, the consequences will depend on why global interest rates were rising. If it were purely an increase in the global risk premium due to a re-pricing of risk, the impact would be largely negative. But if it reflected greater global investment opportunities or greater consumption in Asia, that is likely to be good news for the euro area's external demand.

One caveat is that these macroeconomic model simulations may be too benign for the euro area because the effects are driven by the *effective* exchange rate, which will move by less than the individual bilateral rates. They therefore hide the resource reallocations that are required at the micro level. The firms, industries and regions that are most exposed to the US dollar could be hit hard, while others may benefit from a real depreciation against some Asian currencies. With labour and capital mobility less than desired in the euro area, the adjustment process will not be as smooth as implied by macro models.

There may be other factors to consider. First, the FDI channel will magnify the trade channel. Sales by US subsidiaries of European companies are five times greater than European exports to the United States (BIS, 2001). Second, the more sudden the adjustment, the greater are the chances that financial markets will overshoot and that monetary policy would not have enough time to respond. Third, corporate balance sheets in Europe could worsen, with firms possibly facing liquidity constraints. That raises questions about financial market oversight in the euro area. Finally, financial market turbulence may encourage a new wave of protectionism. All else equal, the ECB should stand ready to ease interest rates or slow down their rate of increase if external factors trigger an appreciation of the euro exchange rate large enough to threaten the economic recovery and impact in a serious way on prospective inflation.

The euro area as part of its shared responsibility with other global players could contribute to a more orderly unwinding of imbalances through productivity-enhancing structural reforms accompanied by growth and stability-oriented macroeconomic policies. Productivity growth that was concentrated just in the export sector would be less useful than economy-wide productivity growth since income and relative price effects would offset each other to some extent: productivity growth in export industries raises European incomes, so they buy more US goods, but European firms also become more competitive relative to US ones. It would help nonetheless, especially in the short-term, because the first effect of a productivity surge, no matter which sector it occurred in, would be to boost the investment rate. While it was retooling, the euro area would run a larger current account deficit.[16]

The transmission mechanism could be made more powerful

There have been numerous studies of the euro area monetary policy transmission mechanism, many of them as part of the Eurosystem's Monetary Transmission Network. De Grauwe and Storti (2005) performed a meta-analysis that synthesised the results from 83 studies of the euro area and the United States. They found that the *average* estimate of the short-term impact of interest-rate changes on output is almost identical in the United States and the euro area although the *median* impact on the US is around 1.5 times as large. The average estimate of the impact of interest-rate changes on inflation is 2.5 times larger in the United States than in the euro area, and the median estimate is 3.25 times bigger. The impacts of monetary policy are greater still in Canada and Australia. These differences are large from an economic point of view, and they suggest that monetary policy is considerably weaker in the euro area. However, from a statistical point of view the meta-analysis had low power, so the estimated differences between the regions were not statistically significant at standard levels of confidence.

Three factors go a long way towards explaining why the transmission mechanism is weaker and why the euro area is less resilient in the face of shocks compared with other, mainly English-speaking countries (Drew *et al.*, 2004):

- First, structural rigidities in product and labour markets cause wages and inflation to be less responsive to economic conditions (Cournède *et al.*, 2005). This creates a trade-off between the short-term and long-term effects. While nominal rigidities can dampen the initial impact of a demand shock, the adjustment back to full employment takes longer. So long as policymakers do not put excessive weight on inflation relative to output stabilisation, the economy would be better off with a short sharp shock rather than a long but shallow recession (*i.e.* the welfare loss would be smaller in the flexible economy). When faced with a permanent shock or a shift in the exchange rate, nominal rigidities make the economy unambiguously worse off by slowing down adjustment (Drew *et al.*, 2004).
- Second, financial markets are neither as deep nor competitive as in other countries. Off-balance-sheet securitisation of mortgages and other consumer loans is less common, although this is partly offset by covered bonds such as *Pfandbriefe* and related vehicles. Securitisation makes interest rates on new borrowing more responsive to financial market developments and also eases access to credit through housing equity withdrawal and more flexible refinancing options. The relatively greater difficulty in accessing credit makes it harder for euro area households to borrow their way through a downturn. And because they hold less of their wealth in financial assets, interest-rate changes affect them less. Other things equal, greater financial integration makes monetary policy work faster, although as noted in Chapter 1 this can be a double-edged sword since stronger wealth effects can magnify cycles if household expectations overshoot into "irrational exuberance". Deeper integration also improves resilience as economies will be better able to absorb shocks. It makes financial institutions stronger through better management and diversification of risk, but changes the nature of systemic risks through contagion effects stemming from cross-border holdings.
- Third, euro area corporations get relatively more of their financing from banks than from capital markets. The credit channel makes the economy more vulnerable to adverse shocks if they are big enough to affect bank balance sheets, in which case investment may stay low for longer. This effect is more important in fragmented and less-diversified

banking systems but it can be reduced if small banks club together into networks, as in Germany. Small firms are more bank-dependent than large ones and therefore are hurt more by credit constraints.

The problems are compounded by the fact that some countries are more flexible than others, so policy has different effects on countries. That makes a common monetary policy more difficult. However, this is a constraint that monetary policymakers must live with; it should not influence policy settings themselves (Box 2.2).

Sticky wages contribute to inflation persistence

Institutional settings make real wages less flexible in Europe than elsewhere. In a meta-analysis of labour market studies, EC (2006) finds that real wages respond more quickly in labour markets that are deregulated and where trade unions are less common. More specifically, they find that less centralised bargaining systems, lower union density and greater use of active labour market policies tend to make real wages more responsive to unemployment. Following a productivity shock, wages respond quicker where benefit replacement rates are low, where there is less employment protection for temporary contracts and where enterprise level bargaining is more common.

The evidence from micro data goes in the same direction but is a little less clear-cut. The Brookings-led International Wage Flexibility Project (Dickens *et al.*, 2006) analysed 31 individual-level data sets in 13 countries. Looking at the distribution of wage changes, it found clear evidence of downward nominal and real rigidities. Real wages are most rigid in Sweden, France and Finland, while they are highly flexible in Greece and the United States. Interestingly, real wage rigidities are on the low side in Germany. Downward *nominal* stickiness is most pronounced in Italy, Greece, the United States and Portugal. The study provides fairly compelling evidence that higher union coverage and union density raise real rigidities but reduce nominal rigidities (perhaps because union representation helps workers protect their real wages, in which case nominal wage changes become less of an issue). There is a weak positive link between employment protection legislation and nominal and real wage stickiness but it is not statistically significant. Aside from the countless technical explanations, there are a couple of reasons why institutions appear to matter less in the micro data than in the macro studies. The first is that they are measuring slightly different things. The macro studies define flexibility as the response of real wages to unemployment and productivity while the micro studies define it in terms of falling nominal or real wages, irrespective of labour market conditions. Second, the micro studies look only at stable permanent jobs. Even in countries with flexible labour markets, full-time workers enjoy protected positions and will be in a good position to resist wage cuts. It may be that flexibility has more impact on new and temporary jobs – *i.e.* institutional flexibility matters most at the margin. It is also worth recalling that there are ways to get around sticky wages. Some firms in Germany have extracted effective wage cuts by raising the number of hours worked for no extra pay.

While freeing up labour markets would help, it goes only half way to solving the inflation stickiness problem. In a cross-country study, Estevão (2005) shows that product market regulations dampen the effects of wage moderation by allowing incumbent firms to appropriate rents rather than pass them on in lower prices.

All in all, these empirical results reinforce the policy recommendations listed in Chapter 1 concerning ways to boost wage and employment flexibility and cut inflation inertia. These

Box 2.2. **What to do when one size does not fit all?**

Should monetary policy care about cross-country divergences in inflation and output growth? The ECB has made it clear that it sets monetary policy for the area as a whole. While it looks at national information to understand what is happening and to improve its forecasts, at the end of the day monetary policy decisions are based on the outlook for the *area-wide* HICP (over the medium-term). But is this optimal? The usual response by economists is to shrug their shoulders and say that there is nothing monetary policy can do about economic divergences, no matter whether they are caused by asymmetric shocks or by a common shock that is propagated in different ways. There are some theoretical arguments why optimal monetary policy might take them into account, especially when they are caused by nominal rigidities,* although practical implementation problems outweigh the theoretical points.

Imagine a two-speed Europe in which one half of the monetary union is more flexible (*i.e.* has lower nominal rigidities) than the other half. When a central bank responds to a shock by steering a policy for the area-wide average, policy will be too tight for one half and too loose for the other. An optimal policy that was interested in maximising the sum of welfare in the two halves would put more weight on the inflexible part of the union. The intuition, loosely speaking, is that the flexible half is going to bounce back no matter what happens, so they do not lose much if monetary policy is not quite right for them. In contrast, the inflexible half gains a great deal if monetary policy suits it better. A central bank that had a fixed target horizon for inflation and ignored divergences within the union would over-react to common shocks and under-react to asymmetric shocks (Gregoriadis *et al.*, 2006). In theory, the solution for such a central bank is to give more weight to the sluggish half of the union when setting policy or give some weight to cyclical divergences in the central bank's welfare function. The ECB's monetary policy framework – with its medium-term orientation, lack of mechanical responses to particular indicators or forecasts and encompassing treatment of available data and information – provides scope to entertain such considerations should this be feasible.

While this is interesting in theory, practical problems make it unworkable (and it should be noted that the ECB's monetary policy framework, with its medium-term orientation, is at least in part immune from such a critique). First, there are enormous problems in measuring the degree of nominal rigidity of the various sectors or regions. It is not even clear at what level such nominal rigidity should be measured – is the relevant unit the industry, region or country? Second, by putting greater weight on the inflexible part of the union, policymakers would be accommodating or even encouraging structural inefficiencies, reducing the incentives for structural reform. Third, policy decisions would be more difficult to explain to the public and the central bank's objective would be less clear. But perhaps the knockout blow comes from Angelini *et al.* (2004). Their modeling work suggests that the central bank could reduce cyclical divergences if it chose to – in their words, it can act as a sheepdog, herding economies together. But the cost is that, for all reasonable parameter values, cycles get magnified considerably. The gains from reduced divergences would not be worth the cost in terms of the standard monetary policy objectives.

* For example, see the May 2005 *ECB Monthly Bulletin*, De Grauwe and Senegas (2003), Gros and Hefeker (2002), Gregoriadis *et al.* (2006).

include a move away from sectoral bargaining, the elimination of wage indexation, ensuring that wage developments are more closely aligned with productivity, and product market reforms to strengthen the link between inflation and the state of activity.

The role of monetary aggregates in monetary policy

There is no question that central banks should monitor monetary developments and assess their implications for price stability. The monetary and economic analyses are intended to complement each other and aim to develop a deeper insight into the risks to price stability at various horizons in order to ensure that the most appropriate policy decisions are made. The ECB's two pillar strategy is one response to the difficulty of finding a single model or analytical framework which encompasses both the economic and monetary analyses in a meaningful way. Its approach is motivated by the historical evidence that money growth and inflation are closely related in the medium to long-run (ECB, 2004) and is intended to ensure policy retains a medium-term focus by reducing the chances of over-reacting to the transient impacts of shocks. One element of the ECB's monetary pillar is the reference value for M3 growth. A growth rate of M3 in excess of the reference value of 4.5% per annum is in principle regarded as signalling a risk to inflation over the medium-term, although it does not imply a mechanical policy reaction. The Bank looks at whether special factors such as portfolio shifts or financial innovation may be distorting the relationship. Moreover it takes into account a wide range of monetary indicators, including the counterparts and components of M3. It gives particular attention to M1 and private sector credit as indicators of aggregate spending (ECB, 2004).

The ECB is not alone in paying attention to monetary aggregates. The Bank of Canada uses a suite of models, including monetary ones; the Bank of England's *Inflation Report* starts by discussing money supply; the quarterly Monetary Policy Reports of the New Zealand, Australian and Swedish central banks regularly discuss money and credit aggregates; only the US Fed does not put any noticeable weight on the money supply, and indeed has stopped publishing M3 (but continues to publish M2). While the ECB goes further by singling out money from other indicators, giving it a special status in its "two pillar" strategy, it is difficult to say whether the differences between the ECB and other central banks are more cosmetic than real. The ECB describes monetary analysis as a "cross check" on the economic analysis to ensure that monetary policy does not overlook important information on future price trends. The Bank of Canada for example performs the same type of cross-checking with its suite of models, but does so less publicly. Ultimately, the question is what weight money should have relative to other indicators of future inflation and how its role in the decision process should be presented to the public.

The ECB gives several reasons for singling out money for special attention (ECB, 2004). They relate to money as a cause and as an indicator of future inflation. There is little disagreement that inflation is a monetary phenomenon in the sense that to be sustained it must be accommodated through monetary expansion. As ECB (2003) points out, money aggregates are a useful guide for day-to-day policy provided two conditions are met. First, the money supply has to be able to predict future movements in the price level. Second, the relationship between the money supply, output, and prices must be stable, or at least predictable. Of course, the same is true for any indicator that the central bank looks at. Thus, to give money a special status requires it to be better than the other variables. The ECB has given a prominent role to money partly because it believes that the money stock provides more information than other indicators about inflation at longer time horizons. In its June 2003 *Monthly Bulletin* (p. 87), it wrote:

> "An important argument in favour of adopting the two-pillar approach relates to the difference in time perspectives for analysing price developments. The inflation process can be broadly decomposed into two components, one associated with the

interplay between demand and supply factors at a high frequency, and the other connected to more drawn-out and persistent trends. The latter component is empirically closely associated with the medium-term trend growth of money."

There have been various studies looking directly at how well monetary indicators predict inflation at different time horizons (see Masuch *et al.*, 2003 for a review). Before 2000, they tended to find that money growth and other indicators such as the monetary overhang or a P^* model helped predict future inflation and that broader aggregates such as M3 tended to work better at longer horizons. Measures of real activity such as the output gap and GDP growth tended to work better at shorter (1 to 2 year) horizons. This pattern is broadly confirmed for the 1995-2000 period in Annex 2.A2.

The forecasting results for 2000 to 2005 are less favourable for money. The results reported in Annex 2.A2 demonstrate that, broadly speaking, monetary indicators became less reliable while the output gap and other activity indicators improved. For example, the real-time estimate of the output gap (*i.e.* the estimate of the output gap made at the same time as the forecast) was better than money growth. This is interesting as the ECB has downplayed the usefulness of the output gap, emphasising how unreliable and prone to revision the estimates can be.[17] GDP growth, industrial production and the OECD's leading indicator all generated lower forecast errors than the monetary indicators from two to four years ahead. Overall therefore, the relative performance of the monetary aggregates appears to be less impressive in the 2000s than in the second half of the 1990s. Of course, while this analysis does provide some grounds for being more circumspect about monetary indicators, it is far from conclusive. It is one type of test over a relatively short sample, and like any econometric test it may suffer from mis-specification or power problems. There are other studies that give a slightly more favourable view of the indicator properties of money in recent years. For example, Hofmann (2006), while finding that monetary indicators have become less reliable in the 2000s, shows more favourable results for the portfolio-shift-adjusted monetary indicator constructed by the ECB. Hence, in coming to an overall assessment it is best to look at results from a wide variety of statistical approaches and try to make a judgement based on the relative strengths and weaknesses of each technique.

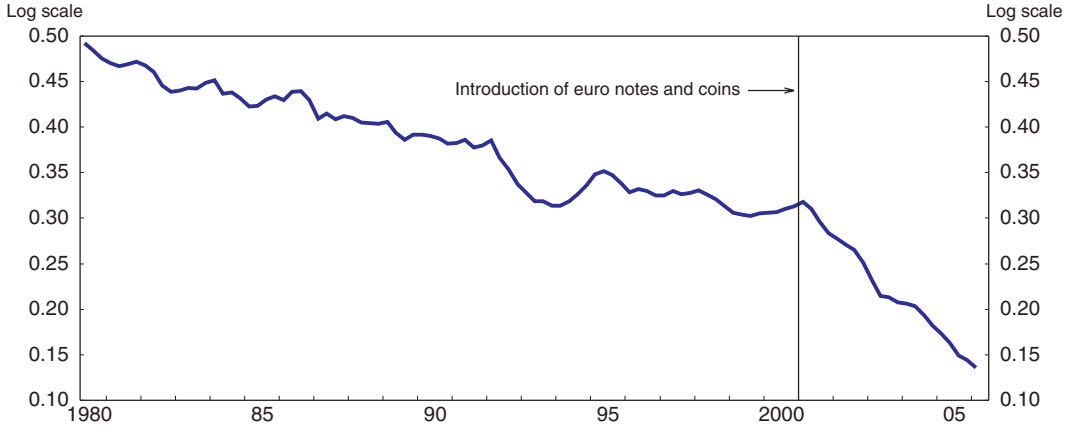
An alternative statistical approach, based on the view that money affects inflation over a longer time horizon, is to use frequency domain techniques.[18] Such studies typically show that the low frequency component of money has been correlated with and generally precedes the low frequency component of inflation. This provides supporting evidence that inflation is a monetary phenomenon in the long-term. However, there are drawbacks with this style of analysis as well (Rae and Bellone, 2007). First, tight correlations are usually observed only if the data is smoothed over very long periods, sometimes a decade or more.[19] Second, they are not especially robust. Different filters produce different outcomes; the results for the euro area excluding Germany are less strong than when Germany is included, suggesting that there may be something specific to one country; and the link is weaker if the 1970s are omitted. This latter finding may be because frequency domain estimates have low power unless very long spans of data are used or it may be because the 1970s were a special case.

A second reason why the ECB has given more emphasis to money is that, unlike in many countries, euro area money demand functions have been relatively stable, at least until the advent of the euro (Bruggeman *et al.*, 2003). There are several reasons why (Calza and Sousa, 2003). *i*) There has been less financial innovation in the euro area and what has

occurred has led to substitution towards instruments that could be considered part of the money stock and which can thus be taken care of by redefining the monetary aggregates. *ii)* Financial innovation has been especially weak in Germany, so its money demand function has been particularly stable. That has helped anchor the euro-area-wide equation. *iii)* The share of wealth held in financial assets is smaller than in other economies, so portfolio shifts between money and bond and stock mutual funds may have been less pronounced. *iv)* The different timing and speed of financial deregulation in euro area countries has spread their overall effect on the euro aggregate over time. *v)* Some of the deregulation has led to substitution within the euro area, which washes out in the aggregate. Most of these factors will play less of a role in future. Because financial innovation has been slow compared with the rest of the OECD, there may be some catching up to do. And this process will become more synchronised across countries as it is driven by the European Commission's welcome drive to create a pan-European financial market.

More recent evidence suggests the money demand function has indeed become less stable.[20] Simply looking at a time series of the velocity of circulation shows this clearly and explains why most econometric relationships have broken down (Figure 2.10). Some studies (for example, Greiber and Lemke, 2005) have shown that a stable M3 demand function can be restored when a measure of uncertainty is added to the specification; this variable is intended to capture the portfolio shifts observed between 2001 and 2003. Boone and van den Noord (2007) show that a stable function can be recovered if proxies for wealth, namely house and stock prices, are included. They show that all the excess M3 growth over the reference value of 4.5% per annum from 1999 to 2004 can be accounted for by the housing market. To the extent that strong money growth reflects lending for house purchases rather than being a monetary overhang, it may have few direct implications for future prices of goods and services – it represents "too much money chasing too few houses", not too much money chasing too few goods. When thought of within an asset portfolio framework, the systematic overshooting of the M3 target may not be a puzzle in a low inflation environment with credible monetary policy where money is considered to be a relatively safe asset that agents are prepared to hold more of as their housing wealth rises.

Figure 2.10. **The velocity of circulation has become less stable**



Source: ECB.

Third, money can be a proxy for other variables that are measured inaccurately or published with a lag. For example, narrow money is a good indicator of current activity in some countries. That may be so, but other indicators such as surveys and high-frequency data also contain useful information. This means that central bankers should extract whatever information they can from money aggregates, just like any other variable.

A fourth argument for paying attention to the money stock is that it can be a proxy for financial conditions more broadly. The historical experience has shown that costly asset price crashes have often been preceded by asset price booms accompanied by brisk growth of credit and money (Borio and Lowe, 2004). In the build-up to an asset price bubble, risk premia and the implicit rate at which investors discount expected future earnings may vary in unpredictable and unobservable ways. Nominal interest rates may therefore give unreliable signals if looked at in isolation. In addition, money and credit can provide information over and above the role of interest rates if imperfections in financial markets lead to borrowing and liquidity constraints, although this effect is asymmetric, operating mainly in a downturn. In this respect, Issing (2002) argues that three great monetary policy mistakes associated with asset price booms – the "roaring 1920s" in the United States, and Japan and continental Europe in the 1980s – could have been avoided if more weight had been given to the signals given by the monetary aggregates.

There are several responses to this argument. First, there is the historical point that the big policy mistake in those episodes was not so much the failure to lean against the boom, but the slowness to ease monetary policy after the downturn (Mishkin, 2006). Second, while paying more attention to the money supply may have helped in those episodes, there are also examples where money supply gave the wrong signal – for example, the United States in the 1990s and Germany and Switzerland for most of the period they were notionally targeting the money supply.[21] While asset price crashes were often preceded by strong monetary growth, the converse is not always the case, implying that monetary indicators have a high false alarm rate: historically, only one in three periods of excess liquidity in OECD countries has been followed by a house price boom and only one in four led to an equities boom (Posen, 2003).[22] Evidence for the euro area shows that money and credit lead house prices in just a handful of countries (IMF, 2005c). But more fundamentally, if it is asset prices that the central bank is worried about, it should respond to those directly using money and credit dynamics to help make an assessment of whether a bubble exists. In any case, if the central bank is concerned about an irrational house price bubble, it may help if it explained to the public clearly and directly that interest rates are being raised for that reason, rather than talking just about excess monetary growth. That way, it may have some chance of calming private-sector expectations and taking some of the steam out the market. Finally, it is far from obvious whether the central bank *should* lean against asset price booms unless the subsequent wealth effects and financial imbalances pose a threat to consumer price inflation. This is a hotly debated issue among central bankers (Box 2.3).

How does the transmission mechanism work?

The appropriate policy response to the money aggregates depends in part on how money affects inflation – that is, on the transmission channel. The effect of money growth on the economy depends on its underlying causes, in particular whether it is demand or supply driven. As a result, there is no mechanical short-run link between money growth and the economy and, by the same token, there is no mechanical monetary policy reaction to

Box 2.3. **Should central banks respond to asset price booms?**

The question of how central banks should respond to asset price booms remains vigorously debated. Leaving aside the most extreme views (that there is no such thing as a bubble, that asset prices should form part of the price index, or they should be targeted directly), the issue is whether central bankers should try to lean against asset price booms even if there does not seem to be any threat to price stability over the medium-term.

On one side are those who argue that central banks should not try to lean against or prick bubbles but should mop up afterwards (Posen, 2006). The US Federal Reserve is in this camp. First of all, bubbles are hard to recognise. It is difficult to know whether an asset price or credit boom is justified by economic fundamentals such as a pickup in productivity growth or whether it reflects irrational exuberance by investors. Second, policymakers couldn't prick a bubble even if they were sure there was one. If a bubble is being driven by irrational expectations of higher returns, an extra 50 basis points on interest rates is unlikely to make much difference and the sort of increase in interest rates that would be required would risk driving the economy into recession. The implicit view is that the reaction to interest rate increases is discontinuous: no reaction to moderate increases, but financial collapse and recession following large increases. Third, they argue that the optimal policy is to cut interest rates aggressively after the bubble bursts. Policy should be asymmetric because the financial transmission mechanism through which asset prices affect economic activity is asymmetric: in a downswing, credit constraints and falling collateral values act as financial multipliers. Fourth, bubbles are harmful only when the financial system is fragile, but a problem of under-capitalised banks or poor supervision should be dealt with directly.

On the other side are those who believe that central banks should lean against asset price booms, even if it means that inflation under-shoots its target for a while (Roubini, 2006). By doing so, policymakers are taking out insurance against a costly boom-bust cycle, and tighter monetary policy is the insurance premium that must be paid. The main arguments are as follows. First, the problem of being unsure whether there is a bubble is no different in principle from the sort of uncertainty that policymakers face all time. An optimal policy rule would still put weight on asset prices, although the weight would be less the greater is the uncertainty. Second, they dispute there being a discontinuous reaction to interest rate increases. In their view there are several examples where central banks have contributed to deflating asset price booms. Third, the type of boom can make a difference. Real estate busts are more costly than equity busts because bank-based financial systems, which are more exposed to real estate, tend to incur larger losses than market-based systems. A fourth argument is sometimes put forward – that an asymmetric policy creates a moral hazard problem for investors (the "Greenspan put", in which the central bank implicitly underwrites the market), but few policymakers take this argument seriously.

The ECB leans cautiously towards the view that leaning against asset price booms may be warranted in some circumstances (Trichet, 2006). It states that "allowing some short-term deviation from price stability in order to better ensure price stability over more extended horizons might – under very restrictive assumptions – be the optimal policy to follow", and this is one of the justifications for its monetary pillar, which can be used to assess "the extent to which excess creation of liquidity and over-extension of credit can be a driving force behind excessively valued assets". However, it emphasises that its strategy does not imply a "systematic reaction to asset price booms, but rather is a selective response based on the careful analysis of all available information". Moreover, the ECB stresses that it does not target asset prices or try to prick bubbles. In its view "the monetary policy instrument is too blunt to allow the type of surgical intervention that the pricking of the bubble would require", and "it is likely that the circumstances in which a policymaker will embark with confidence upon leaning against the wind policy will occur rarely".

money growth. If observed money growth were driven by an expansion of the money supply, the conventional view is that money affects inflation by first affecting real activity. The difficult question then becomes whether policy should react to money growth when it sees it, or whether it should wait until the first confirmatory signs that output is picking up. The answer will depend on the reliability of monetary signals versus the length of the lags in policy, and in particular whether waiting for output to move would be leaving it too late. This question has not been fully answered in the policy literature. Money may also operate through the asset price channel, the implications of which were discussed above. Alternatively, the broad money aggregates may be largely endogenous, responding to rather than causing economic activity. In this case, the central bank might still put some weight on the money supply as an indicator of the state of the business cycle. The issue then, as discussed above, is how reliable money aggregates are compared with other indicators.

Policy implications

To sum up, some recent evidence has weakened two of the rationales that were used to justify the prominence given to monetary indicators: money demand functions are less stable than they were and the leading indicator properties of money appear to have diminished. Different methods, however, can give different answers. Where does this leave us? If it is accepted that a central bank should look at everything, the issue comes down to the appropriate weight to put on money relative to other indicators and on how to communicate policy decisions when different indicators may be giving different signals. The ECB's two-pillar framework is one response to the difficulty of finding a single model or analytical framework which encompasses both the economic and monetary analyses. However, presenting monetary policy decisions to the public within this framework, which reflects the complexity of the decision-making process, poses communication challenges. In responding to these challenges, the ECB has now achieved a high degree of predictability for its monetary policy decisions over shorter horizons. Yet other challenges remain. For example, it is sometimes argued that external observers do not know how much weight the ECB puts on money in its policy making process in practice. Many suspect it is too high. It would help if the ECB continued to enhance its communication strategy in order to be even clearer about the analysis underlying its policy assessments at any point in time. There is no perfect way of doing this, but some options for the presentation of the monetary analysis include:

- Publishing quantified, money-based medium-term inflation forecasts along with the quarterly inflation projections based on its economic analysis. The ECB went some way in this direction in recent *Monthly Bulletins* where it published forecasts for the average inflation rate over various horizons, including 2006-09. These were based on a range of money-based models and showed that the median model predicts inflation in the 2.5 to 3% range over that period.[23] However, the information could be enhanced in several ways, especially by showing how much of the inflation forecast is due to money growth compared with other factors in the model. One way to illustrate this would be to show what the models would predict if the components of money were growing at a lower rate, such as the reference rate of 4½ per cent per annum. It could also try to quantify the distribution of risks around these monetary forecasts.
- As the ECB "has developed a framework for extracting the signal in monetary developments that is relevant for policy assessments from the inevitable noise in the monthly data" (Issing, 2006), it could publish and describe this information in more

meaningful ways. It periodically publishes M3 adjusted for the estimated impact of portfolio shifts, but this is not quite the same as publishing a thorough analysis of low-frequency information.

At the same time, the ECB could improve its communication regarding the economic analysis. For example:

- It could extend the horizon of its economic forecasts now that it uses forward market rates for its interest rate assumptions. Policy decisions at the time of writing (September 2006) must focus on the outlook for inflation in 2008 and beyond, yet forecasts for 2008 will not be published until December. Currently, the ECB publishes annual ranges for inflation and output with a short description. In the interest of further enhancing its communication, the ECB could consider publishing a more detailed analysis and reasoning behind its forecasts, although whether this would increase transparency in the context of its two-pillar strategy, where such forecasts play only a partial role in the process underlying monetary policy decisions, remains open to question.
- It could also try to quantify more precisely the risk distribution around its forecasts at various horizons, perhaps by using a "fan chart", although better alternatives could also be developed.

Notes

1. There is some evidence that the distribution of price changes is twin-peaked with the clustering around zero and another clustering around 2%. If so, it is not possible to get a summary measure of central tendency in a single number. That is one reason why the different measures of core inflation, especially the means and medians, will give conflicting signals from time to time.
2. An interesting aside to the econometrics in Annex 2.A1 is that there is statistically significant evidence that the ECB's 2% inflation objective helps to anchor inflation expectations: expected inflation appears to be roughly a 50:50 weighted average of past inflation and the 2% medium-term objective.
3. Anecdotally at least, the euro is gaining popularity in cash transactions overseas at the expense of the US dollar. This reflects geography (the euro is gaining ground for transactions in Russia and Eastern Europe), politics (Fidel Castro has declared that the US dollar is not welcome in Cuba, but the euro is), and crime (the largest readily available US banknote is the $100 bill whereas the ECB prints € 200 and € 500 bills; these are more convenient to transport and, if necessary, swallow: in October 2004 a drug mule travelling from Spain to Colombia was found to have € 200 000 of euro notes in his stomach – see Gross, 2004).
4. M&A activity has risen to levels last seen in the ICT-driven boom of the late 1990s and early-2000s. In the year to May 2006, the value of M&A transactions in which a euro area corporation was the purchaser amounted to € 466 billion (almost exactly half the US level), of which € 280 billion was for the non-financial corporate sector. Almost all of the latter was settled in cash or debt with a very small contribution from equities. Just under a third of deals by value among non-financial corporations in 2005 were domestic takeovers, while 14% were cross-border within the euro area. The United Kingdom and the new member states of the EU were the main foreign targets. M&A activity by financial corporations has also picked up, reflecting consolidation in the banking sector. Domestic mergers accounted for half of the deals by value in 2005, with another third coming from cross-border takeovers within the euro area.
5. Deflated by the HICP.
6. House price estimates are available only for the seven euro area countries shown in Figure 2.5, but they account for 89% of euro area GDP.
7. For a comparison with other countries, see *OECD Economic Outlook* No. 77-80.
8. See Box 1.5 of *OECD Economic Outlook* No. 79, June 2006 and Box 6 of the ECB's *Monthly Bulletin*, August 2006. The estimated effect is a combination of declining prices and increased market penetration. The share of extra euro area manufacturing imports coming from low cost countries has increased to 49% in 2005, up from 34% a decade earlier. Almost all of this is accounted for by China and the new EU member states (which now have roughly equal import shares).

9. In absolute terms, the two biggest reserve holders are Japan and China. They accounted for around half of world reserve accumulation from 2002 to 2004 and in 2005 held around 40% of the world's stock of reserves. Among the major reserve holders, the countries with the largest level of reserves relative to GDP are Singapore (104%), Chinese Taipei (78%), Hong Kong (75%), Malaysia (55%), Algeria (53%) and China (37%) – see ECB (2006c). Note that these statistics do not include the assets of state-owned oil funds.

10. The foreign reserve statistics may flatter the US because they do not include assets of state-owned oil funds, which are often invested in equities and may be more globally diversified, and because derivatives such as foreign exchange swaps allow effective exposure to other currencies even if underlying assets remain denominated in US dollars.

11. There has been an energetic debate about how much the US fiscal deficit has contributed to the current account deficit, with a consensus that the impact is probably not large (perhaps 1 to 2 percentage points; see Jarrett, 2005 and Issing, 2005).

12. In 2001, the main external bond investors in the euro area were Japan (33%), the UK (28%), the US (14%), Switzerland (11%), and all other countries making up the remaining 14%. More recent data are not available, although flow data suggest that the UK, the US and offshore financial centres have been the main source of inflows over the past four years.

13. The United States and Asia are about equally important for euro area goods trade. In 2003, the US bought 17% of euro area goods exports and Asia bought 19% (of which China accounted for 2.7% and Japan for 3%).

14. Some studies of global adjustment find that a revaluation of China's exchange rate would have a negligible impact on global imbalances (*e.g.* McKibbin and Stoeckel, 2003). It would slow the Chinese economy, but China's imports and exports would fall in tandem because the income effects offset the price effects, leaving its savings – investment imbalance, and therefore its current account surplus, roughly unchanged. But the corollary to this view is that it implies there is no imbalance in China today. If so, it is difficult to explain why China's central bank needs to accumulate foreign reserves so aggressively in an attempt to hold down its exchange rate.

15. The main transmission channels include: *a)* the trade channel, which depends on the degree of import price pass-through; *b)* the interest rate risk premium channel; *c)* the net wealth channel, as a stronger euro raises household wealth; *d)* the asset price channel, as firms have assets and liabilities denominated in different currencies; *e)* the intermediate inputs channel, as relative prices among sectors will change; *f)* the expectations channel, as forward-looking agents bring forward the response to long-term relative price shifts; and *g)* the credit or liquidity channel as a change in foreign demand for liquid assets flows through the financial and corporate sectors. Models such as INTERLINK include only the first channel and aspects of the second.

16. Erceg *et al.* (2006) show that the composition of trade can have a significant impact on current account adjustment scenarios. US trade is heavily concentrated in capital goods and consumer durables, while many models used to simulate current account adjustment assume a single aggregate measure of real activity such as domestic absorption. In their open economy dynamic stochastic general equilibrium model, foreign investment shocks can have a large impact on the US trade balance without any significant change in exchange rates.

17. The ECB emphasises that the output gap is difficult to measure, but so too is money. There is a conceptual question of what should be included in a money aggregate, and how they should be aggregated. Also, the aggregates are adjusted for portfolio shifts, but recognising and adjusting for these in real time is just as much an art as is the case of estimating the output gap.

18. For example, see Neumann and Greiber (2004), Bruggeman *et al.* (2005) and Assenmacher-Wesche and Gerlach (2006).

19. More precisely, the money-inflation correlation is high only for cycle periods of ten years and upwards.

20. See Boone and van den Noord (2007); Dreger and Walters (2006); Gerlach and Svensson (2003); Carstensen (2004); Kugler and Kaufmann (2005) and Greiber and Lemke (2005).

21. Mishkin (2006) argues that because they were comfortable missing money targets so long as inflation appeared to be on track, German and Swiss monetary policy "was actually closer in practice to inflation targeting than it was to Friedman-like monetary targeting, and thus might best be thought of as hybrid inflation targeting" (p. 500).

22. Borio and Lowe (2002) show that bubbles are correlated with long credit booms. Specifically, an early warning when both the credit-to-income ratio and real asset prices simultaneously deviate from their trends by 4 percentage points and 40% respectively would have predicted half of financial crises three years in advance, with a very low false alarm rate. The credit-to-income ratio on its own has a higher false alarm rate, reinforcing the point made later that central banks should wait until asset prices start to move before they react. For the euro area at the end of 2005, the gap between the credit-to-income ratio and its trend was around half a percentage point, well under the 4% threshold. Adalid and Detken (2006) show that a slowdown or recession following an asset price boom is likely to be more severe if there was excess M3 growth (but not excess credit growth) during the boom phase. However, the interpretation of this result is complicated by the finding that excess credit growth does not affect the size of the slowdown after the boom. This begs questions about the transmission mechanism.

23. The M3 model has predicted HICP inflation reasonably well from 2002 to 2004, which in some ways is worrying. Oil prices and administered prices clearly played an important role over that period, and they are not driven by the euro area monetary aggregates, suggesting that at least part of the models' good performance is fortuitous.

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ANNEX 2.A1

Headline and core inflation: what attracts what?

The initial impact of an oil price shock is to raise the headline inflation rate but leave most measures of core inflation unchanged. Once a gap between headline and core opens up, does headline tend to fall back towards the core rate or does the core rate rise to meet headline, perhaps through expectation or indexation effects? This annex looks at the relationship between headline and a variety of core measures over the past decade.

Simple equations for headline and core inflation are estimated jointly. The equations are symmetric in the sense that they both have the same form, and each equation includes the lagged gap between headline and core to capture feedback effects between the two. The equations are described below. Inflation is defined as the quarterly log-change in the relevant price index. The inflation rate is denoted by π, and the superscripts *h*, *c*, *e* and *oil* refer to *headline*, *core*, *expected* and *oil price* inflation respectively. Oil price inflation is defined as the change in the logarithm of real oil prices measured in euros. *Gap* refers to the output gap:

$$\pi_t^h = \pi_t^e + \beta^h\left(\pi^h - \pi^c\right)_{t-1} + \gamma^h \pi_t^{oil} + \delta^h\, gap_t$$

$$\pi_t^c = \pi_t^e + \beta^c\left(\pi^h - \pi^c\right)_{t-3} + \gamma^c \pi_t^{oil} + \delta^c\, gap_t$$

Expected inflation is assumed to have forward and backward-looking elements. Specifically, it is a weighted average of the ECB's medium-term price stability objective (assumed to be 2%) and lags of actual inflation:

$$\pi_t^e = \alpha\left(2/400\right) + (1-\alpha)\left[\phi\pi_{t-1}^{h\ or\ c} + (1-\phi)\pi_{t-2}^{h\ or\ c}\right]$$

The key parameters are β^h and β^c, relating to the gap between headline and core inflation. If core inflation attracts headline (*i.e.* after a shock such as an increase in oil prices, headline inflation reverts to core) then β^h should be negative. If core inflation rises to meet headline, β^c should be positive. The slightly different lag structure (a one-quarter lag *vs.* a three-quarter lag on the gap term) is determined empirically. Oil prices are treated as exogenous[1] while non-commodity import prices tended to be insignificant over this sample.

The equations are estimated jointly using two-stage least squares from 1996q1 to 2006q1. Lagged variables are used as instruments. The time period is fairly short due to data limitations, so the results cannot be regarded as fully worked-out models of the inflation process. Rather, they should be interpreted as a simple test of the feedbacks between headline and core inflation.

Thirteen measures of core inflation were tested separately (see Catte and Sløk, 2005). The parameter estimates are shown in Table 2.A1.1. Estimates significant at the 5% level are shown in bold. They key results are:

- The feedback or equilibrium correction coefficient β^h is large and negative in all cases, and is statistically significant in all but one. This implies that there is a strong tendency for headline inflation to revert back towards core inflation: *i.e.* core attracts headline.
- The exclusion-based measures of core (HICP excluding energy and various other components) are the weakest attractors of headline inflation. Thus they are not particularly good guides to future developments in headline inflation.
- There is a small positive feedback from headline to core inflation (β^c), with a lag of around three quarters. Thus, a shock to headline inflation will be passed on to core inflation to some extent. The parameter estimates imply that a 1% increase in headline inflation will lead to a rise in core inflation of between 0.05% and 0.25% after three quarters (other lag lengths were tested, with a nine-month lag being the most significant).
- Oil prices have a direct impact on headline inflation but in general do not have a direct impact on core inflation. The main exceptions are the trimmed means in which a relatively small amount is trimmed off each tail of the distribution.
- The output gap has a strong and statistically significant impact on all measures of core inflation. Its impact on headline inflation is of a similar magnitude but is usually not statistically significant. Changes in the output gap (which can be thought of as a speed limit effect, and over a short sample are a reasonable substitute for the GDP growth rate given that potential growth is smooth) were not significant as an additional explanatory variable when the gap was included.

Table 2.A1.1. **Parameter estimates of headline and core inflation equations**

	Headline inflation					Core inflation				
	2% target	lagged inflation	Headline-core gap	Real oil prices	Output gap	2% target	lagged inflation	Headline-core gap	Real oil prices	Output gap
	α^h	φ^h	β^h	γ^h	δ^h	α^c	φ^c	β^c	γ^c	δ^c
Excl. energy and unprocessed food	**0.54**	**0.55**	**–0.37**	**0.99**	**0.19**	0.17	0.31	0.10	–0.07	**0.14**
Excl. food, energy, alcohol and tobacco	**0.55**	**0.48**	–0.31	**0.98**	**0.19**	0.16	0.24	0.08	–0.08	**0.15**
Weighted median	0.32	**0.81**	**–0.80**	**0.98**	0.14	**0.21**	**0.35**	**0.16**	0.03	**0.12**
Trimmed mean: 2%	**0.56**	**0.56**	**–1.04**	**0.94**	**0.16**	**0.52**	0.24	0.13	**0.65**	**0.16**
Trimmed mean: 5%	**0.51**	**0.63**	**–0.69**	**0.96**	**0.15**	0.25	0.26	0.23	**0.38**	**0.14**
Trimmed mean: 10%	**0.47**	**0.70**	**–0.65**	**0.94**	0.14	0.18	0.18	**0.18**	**0.20**	**0.14**
Trimmed mean: 15%	**0.42**	**0.76**	**–0.71**	**0.97**	0.12	0.16	0.18	**0.17**	**0.15**	**0.14**
Trimmed mean: 25%	0.36	**0.81**	**–0.79**	**0.98**	0.13	**0.17**	0.27	**0.16**	0.10	**0.13**
Huber skipped mean	**0.41**	**0.76**	**–0.65**	**0.97**	0.12	**0.18**	0.27	**0.11**	0.03	**0.13**
Volatility weighted mean: 1	**0.52**	**0.61**	**–0.39**	**1.03**	0.12	0.12	**0.61**	0.07	0.06	**0.13**
Volatility weighted mean: 2	**0.50**	**0.62**	**–0.43**	**1.02**	0.13	0.14	**0.40**	0.10	0.05	**0.14**
Double weighted mean: 1	**0.43**	**0.80**	**–0.69**	**1.02**	0.11	**0.17**	**0.47**	**0.16**	0.05	**0.14**
Double weighted mean: 2	**0.43**	**0.76**	**–0.71**	**1.00**	0.14	**0.18**	**0.29**	**0.21**	0.10	**0.14**

Note: Parameters significant at the 5% level are shown in **bold**.
Equations are jointly estimated using two-stage least squares from 1996q1 to 2006q1.

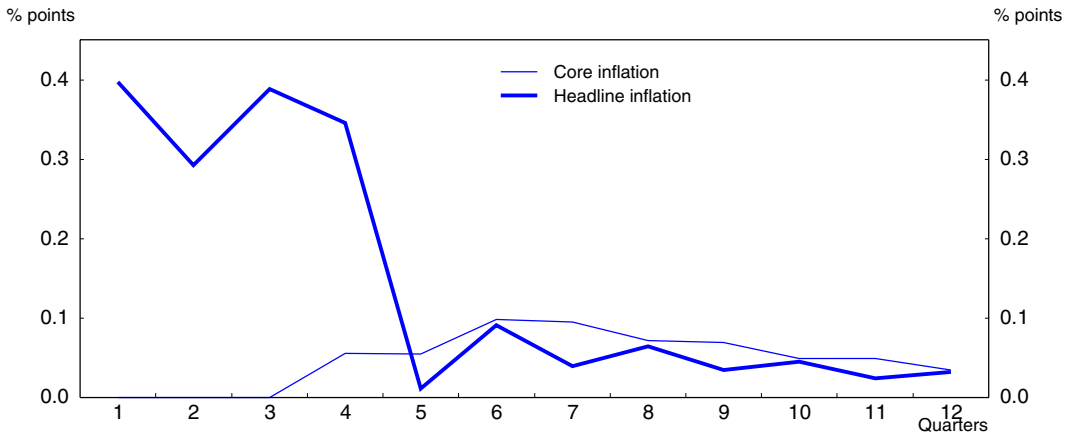
- The ECB's inflation objective (and, implicitly, the inflation credibility of the major continental European central banks before the creation of the euro) appears to help anchor inflation expectations. Expected headline inflation is roughly a 50:50 weighted average of past inflation and the medium-term objective of 2%. Core inflation does not appear to be so well anchored, perhaps because the headline rate is what the public sees but also because some measures of core have lower mean than the headline rate.[2]

These results are broadly consistent with the conclusions in Catte and Slok (2005) and Stavrez (2006). EC (2006) compares three measures of core inflation but it differs from this exercise in three ways: their equation is a subset of the equation used here (it incorporates just the gap term with no oil effect, and does not allow for two-way feedback); it is estimated over a shorter sample (1999 onwards); and it uses a twelve-month rate of change. It finds that a weighted median has more predictive power than the CPI excluding energy.

To illustrate the dynamic response of the system, Figure 2.A1.1 shows the impact on inflation of a 50% increase in oil prices. Headline inflation rises immediately, by around 0.4 percentage point,[3] but falls back close to baseline after one year. Core inflation[4] peaks at around 0.1 percentage point above baseline about a year and a half after the shock, and gradually diminishes thereafter.

Figure 2.A1.1. **Impact of a 50% increase in oil prices on inflation rate**

Shock minus control



Source: OECD calculations.

To sum up, there is feedback in both directions but the extent to which core attracts headline is about four times stronger than the link in the other direction and is considerably quicker.

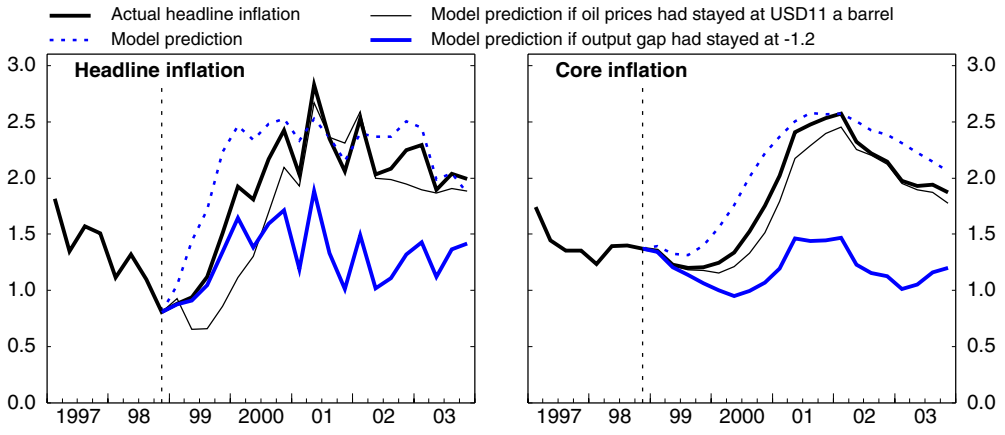
What happened around the turn of the millennium?

One reason why some commentators have wondered whether headline leads core is that it appeared to do just that around the turn of the millennium. This model helps shed some light on that period. The first point is that the most commonly watched measure of core (HICP excluding energy and unprocessed food) was one of the last to move; other indicators such as the median moved well beforehand. This is consistent with the results shown above that this measure does not perform as well as the others. But more fundamentally, the low rate of headline inflation in 1998 was partly due to falling oil prices:

the world price of crude fell below $11 a barrel over the course of the year. By 2000, the price was $30. The bounce-back in oil prices should have pushed up headline before core, and by a greater amount. But at the same time as the oil price was rising, the euro area economy was picking up. With strong GDP growth, the output gap swung from negative to a large positive value. That pushed up core and headline inflation. In summary, the economic recovery drove up core inflation in 2000; that happened to occur a year after oil prices rebounded, making it look as though the oil price shock was responsible. The relative contributions of oil and the gap to inflation at that time can be seen in Figure 2.A1.2, which shows a dynamic simulation of the headline-core system. This shows that the rise in core and headline inflation was if anything slower than the model predicted. The pickup in core is mostly explained by the output gap (seen by the difference between the two lines labelled "model prediction" and "model prediction if output gap had stayed at –1.2") with a small contribution from oil in 2001, whereas the main contributor to the rise in headline inflation was the oil price increase. Note that if core had been "chasing" headline, we would expect the model to under-predict, whereas the opposite appeared to happen.

Figure 2.A1.2. **Inflation forecasts**

Dynamic simulation from two-equation system of headline and median inflation



Source: OECD calculations.

Notes

1. It is possible that inflation expectations affect oil prices (see Trehan, 2005), although this is more likely to be an issue for the US than for the euro area.
2. Most core measures of inflation have averaged at least 0.1% per annum less than the headline inflation rate since 1996. The largest differences are the volatility-weighted means (0.3-0.4% below the headline rate on average) and the double-weighted means (0.2-0.3% below).
3. This impact is a little lower than the "ready reckoners" from the OECD INERLINK model and from mechanically applying the weights of transport fuel and lubricants in the CPI on the assumption that the oil price increase leads to a 1:1 increase in prices of refined petroleum products – these would show an impact closer to 0.6 or 0.7 percentage point (OECD, 2004). The lower impact here may be because the assumption of 1:1 pass-through is not appropriate or because the equations were estimated since the mid-1990s, a period when pass-through of oil shocks to consumer prices appears to have been lower than in the past. In any case, the main point here is not the precise magnitude but the relative movements of core and headline inflation.
4. The model used here is the one for the median inflation rate.

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ANNEX 2.A2

Is money a useful indicator?

Inflation is a monetary phenomenon is the sense that, to be sustained, it must be accommodated through monetary expansion. But as the ECB points out (ECB, 2003), two conditions must be met for monetary aggregates to be a useful part of day-to-day monetary policy. First, money has to be able to predict future developments in the price level. Second, the relationship between money, output, and prices must be stable – or at least predictable. Of course, the same conditions are true for *any* indicator that the central bank may look at. Thus, to give the money supply a special status requires that it performs better than the other indicators that are available to policymakers. Indeed, the ECB has given a prominent role to money partly because of its belief that monetary growth provides information about inflation at longer time horizons than the other indicators.

This annex reviews the information content of various monetary indicators, and in particular whether things have changed in the 2000s. In essence, it runs out-of-sample forecasting tests to see whether various indicators help predict future inflation. The focus is on the annual HICP inflation rate. The first step is to estimate a baseline model in which inflation is regressed on its own lags. Changes in oil prices are also included as they have had a strong influence on the headline rate of inflation over the past few years. If oil prices were omitted, it can be argued that the tests would be biased and unreliable because the "best indicator" would be the one that was correlated with oil prices, especially in the 2000s, even if this correlation was coincidental.[1] In other words, by including oil prices we implicitly assume they are exogenous with respect to the various euro area indicator variables. This is probably a reasonable assumption for most indicator variables shown below, including the monetary aggregates. While there may be a common global factor behind movements in oil prices and in the euro area monetary aggregates, the euro area should have been able to partially if not fully insulate itself from that since it has a floating exchange rate and in any case it seems implausible that a common factor would explain more than a small proportion of the co-movement between the two variables. Hence, the assumption of weak exogeneity seems to be a reasonable approximation. The exercise conducted here is similar to that of Nicoletti-Altimari (2001) in the sense that it conducts a crude "tournament" in which various indicators are assessed for their ability to predict inflation out of sample. But it differs in some of the technical details: his sample period was 1992 to 2000, he had fewer variables in the tournament, he did not condition on oil prices, he looked at average inflation rates over a particular period rather than annual rates and he estimated the optimal lag structure for each period and each indicator. Both approaches should be regarded as tests of the *minimum* requirement for the utility of an

indicator variable, namely that they have predictive power in a bivariate model. A more comprehensive but much tougher test would be to add various indicators to a fully specified structural model of inflation and test their marginal predictive power.

The baseline model for an *n*-quarter-ahead forecast is:

$$\Delta_4 \log p_t = \alpha_0 + \alpha_1 \Delta_4 \log p_{t-n} + \alpha_2 \Delta_4 \log p_{t-(n+4)} + \alpha_3 \Delta_4 \log p_{t-(n+8)} + \beta_0 \Delta_4 \log poil_t + \beta_1 \Delta_4 \log poil_{t-4} + \beta_2 \Delta_4 \log poil_{t-8}$$

where p_t is the HICP price level and $poil_t$ is the domestic-currency oil price.

This equation is estimated on quarterly data from 1980 onwards. To simulate the sort of forecasting problem that policymakers face in real time, a set of rolling regressions is estimated and rolling out-of-sample forecasts are made. Some indicator variables, such as money growth, are then added to the equation and the rolling forecasting exercise is repeated. (*i.e.* the model is estimated up to some point; post-sample forecasts are made; then the sample period is extended by another quarter and the exercise is repeated). It differs from a genuine real-time exercise in a number of ways, in particular by conditioning on oil prices. This is done to isolate the contribution that money makes to reducing forecast errors without mixing it up with the inevitable (and large) errors that were made predicting oil prices. The estimated equation for an *n*-quarter-ahead forecast then becomes:

$$\Delta_4 \log p_t = \alpha_0 + \alpha_1 \Delta_4 \log p_{t-n} + \alpha_2 \Delta_4 \log p_{t-(n+4)} + \alpha_2 \Delta_4 \log p_{t-(n+8)} + \beta_0 \Delta_4 \log poil_t + \beta_1 \Delta_4 \log poil_{t-4} + \beta_2 \Delta_4 \log poil_{t-8} + \gamma_0 Z_{t-n} + \gamma_1 Z_{t-(n+4)} + \gamma_2 Z_{t-(n+8)}$$

where Z_t is the indicator being tested.[2]

In order to see whether each indicator's predictive power has changed, the forecasting period is split into two halves: 1995 to 2000; and 2000 to 2005. The indicator variables that are tested are described below:

- Monetary indicators:
  - The growth rates of M1, M2, M3 and the ECB's estimate of M3 adjusted for portfolio shifts that are not expected to affect inflation.
  - The growth rate of lending to the private sector.
  - The monetary overhang: the difference between actual M3 money balances and their equilibrium level. This is proxied by the residuals from a simple long-run money demand equation in which real M3 depends on real output and short-term and long-term interest rates.
  - P^*: the P^* indicator is based on the quantity theory equation (MV = PY) and is defined as the long-run equilibrium price level that would result with the current money stock, provided that output was at potential and velocity was at its long-run equilibrium level ($P^* = MV^*/Y^*$). It is calculated in a similar way to the monetary overhang, except that the equilibrium is calculated by substituting in the long-run or potential levels of output and velocity rather than their actual values.
- Gap or capacity indicators:
  - The output gap (from *OECD Economic Outlook* No. 79).
  - The real-time output gap, which was the estimate and forecasts of the output gap made at the relevant time period. For example, if the equation is estimated up to September 2001 the forecasts are based on the output gap that was estimated in the *OECD Economic Outlook* No. 70.

- The unemployment gap: the unemployment rate minus the NAIRU. The latest estimate of the NAIRU is used because real-time estimates are unavailable (although they could in principle be extracted from the Kalman filter estimation process used to calculate the NAIRU).
- Capacity utilisation in manufacturing.

- Other indicators:
  - Growth in GDP, both real-time and final estimates.
  - Growth in industrial production and equity prices.
  - The OECD leading indicator.
  - The slope of the yield curve.

The key results are summarised in Table 2.A2.1, which shows the mean absolute forecasting error of the various models. For example, the univariate baseline model had an average one-year-ahead forecast error of 0.87 percentage point over the period 1995 to 2000. Models that do better than the baseline are highlighted in bold.[3] Looking first at the period 1995 to 2000, several interesting results emerge. First, several monetary indicators do contain useful information in the sense that they reduce the inflation forecast error. The growth rate of M2 leads to a slight improvement in the forecasts at shorter horizons while M1 and especially M3 work better at longer horizons. The P^* indicator is also a good performer, but interestingly credit growth has little predictive power. Some other indicators perform about as well as the monetary aggregates. Measures

Table 2.A2.1. **Inflation forecast errors**

Mean absolute out-of-sample forecast error, percentage points

	1995-2000				2000-05			
	1 year ahead	2 years ahead	3 years ahead	4 years ahead	1 year ahead	2 years ahead	3 years ahead	4 years ahead
Baseline	0.87	1.66	1.39	1.56	0.45	0.73	1.01	0.80
Monetary indicators								
M1	1.48	**1.32**	**0.86**	**1.44**	0.61	**0.71**	**0.69**	1.26
M2	**0.48**	**0.96**	1.41	3.82	0.52	0.76	**0.86**	0.87
M3	0.93	**1.23**	**0.79**	**0.61**	0.52	1.00	1.28	1.33
M3 adj. for portfolio shifts	. .	. .	. .	. .	0.54	0.95	1.27	1.41
Credit	0.94	1.82	2.31	2.07	**0.40**	0.90	1.65	2.07
Monetary overhang	0.96	**1.06**	**0.90**	**1.12**	1.05	0.81	**0.95**	0.80
p*	**0.83**	**0.90**	**0.76**	**0.56**	1.12	1.00	**0.92**	**0.75**
Gap indicators								
Output gap	**0.62**	**1.33**	1.91	1.59	**0.40**	**0.29**	**0.48**	**0.39**
Real-time output gap	1.07	**1.41**	**1.28**	1.65	0.47	**0.66**	**0.93**	**0.75**
Unemployment gap	0.94	**1.32**	1.54	**1.42**	**0.36**	**0.28**	**0.46**	**0.55**
Capacity utilisation	1.40	2.94	1.98	3.18	0.50	1.06	1.51	2.00
Other indicators								
GDP growth	0.93	**0.89**	**0.68**	**0.64**	0.52	**0.47**	**0.64**	**0.55**
GDP growth: real time est.	**0.93**	**0.92**	**1.10**	**1.47**	0.52	**0.52**	**0.89**	0.80
Industrial production	**0.72**	**1.58**	1.61	2.08	0.49	**0.38**	**0.59**	**0.40**
OECD leading indicator	**0.76**	**1.53**	1.46	1.70	0.47	**0.37**	**0.60**	**0.40**
Business confidence	1.70	2.54	1.52	1.68	0.50	0.91	1.31	1.45
Equity prices	0.93	1.84	1.43	1.79	0.47	0.77	**0.95**	0.82
Yield curve slope	1.37	2.53	2.70	2.87	0.50	**0.70**	**0.86**	**0.32**

Note: **Boldface** is used to highlight models which are better than the baseline.

of the current state of activity, such as GDP growth, industrial production and the OECD's leading indicator, tend to work better at shorter horizons. All in all, the results for the 1995 to 2000 period are broadly consistent with the view that monetary aggregates provide some useful information at longer time horizons.

The situation changes to some extent in the 2000 to 2005 period. The predictive power of the broader monetary aggregates declines noticeably, except for P* which remains useful at longer horizons. Moreover, other indicators tend to outperform the monetary indicators. The real-time estimate of the output gap and real-time GDP growth were at least as useful as money growth, while (final) GDP growth, industrial production and the OECD's leading indicator generated substantially lower forecast errors even three or four years ahead. Overall therefore, the relative performance of the monetary aggregates was much less impressive in the 2000s than in the second half of the 1990s.[4]

Repeating the exercise using core inflation (HICP excluding energy and unprocessed food) leads to qualitatively similar results – that monetary aggregates do reasonably well in the 1995 to 2000 period, although not noticeably better than the other indicators, but they perform very poorly in the second half of the sample. They have virtually no predictive power over any horizon in the 2000-05 period whereas various other indicators generate substantially lower forecast errors even at longer horizons.

Concluding comments

This annex has presented some evidence that, conditioning on oil prices: *i)* monetary indicators may have had reasonably good predictive power in the 1995-2000 period; but *ii)* they appear to have lost much of their predictive power in the 2000s, at least so far. However, it is worth bearing in mind that these conclusions are far from definitive as they relate to a single tournament over two specific time periods. Other statistical methods can of course give different results. Varying the lag structures or eliminating the constant term for example may affect the outcomes. Moreover, the results may reflect a *temporary* decline in the usefulness of monetary aggregates due to a structural break in economic relationships with the advent of the euro or due to some other event. "Normal service" may return eventually, but it will be some time before policymakers will be able to say with confidence whether the predictive relationships have indeed reasserted themselves.

Notes

1. In a recent paper, Hofmann (2006) performs a similar exercise to the one conducted here except he does not take account of energy prices. That may partly explain why his results are slightly more favourable to M3 adjusted for portfolio shifts, although his basic results are broadly consistent with the conclusions of this annex in that they find some deterioration in predicting power in the 2000s. He concludes that a broad based monetary analysis is needed to extract the information content of monetary developments.
2. Implicitly this formulation assumes perfect foresight regarding oil prices, or equivalently it eliminates forecast errors stemming from energy prices in order to focus on the remaining predictive errors that are of primary interest here. Repeating the exercise without oil prices leads to a very poor performance of the equations that include monetary indicators. Note also that a constant term has been included and the coefficients on the lagged dependent variable are not restricted to sum to one because this is a simple bivariate forecasting equation rather than a structural model of inflation.
3. Differences in forecast accuracy were assessed using the Diebold-Mariano test. In general, however, the test had low power to discriminate between models at conventional significance levels because the number of independent observations was low.

4. Comparing mean errors rather than absolute errors can give a measure of average forecast bias. These results, which are not reported here, show that the money aggregates tended to reduce the forecast bias in the 1995 to 2000 period but in the 2000 to 2005 period they led to considerably more biased forecasts (over-predicting) relative to the other indicators for horizons of two years ahead and longer.

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ISBN 92-64-02988-5
OECD Economic Surveys: Euro area

Glossary

APW	Average production worker
CPI	Consumer price index
ECB	European Central Bank
EDP	Excessive deficit procedure
EMU	Economic and Monetary Union
EMS	European Monetary System
ERM	Exchange rate mechanism
ERM II	Exchange rate mechanism II
EU	European Union
FDI	Foreign direct investment
HICP	Harmonised index of consumer prices
ICT	Information and communication technology
GDP	Gross domestic product
M&A	Mergers and acquisitions
MFP	Multifactor productivity
MPC	Marginal propensity to consume
MTO	Medium-term objectives
NAIRU	Non-accelerating inflation rate of unemployment
PPP	Purchasing power parity
R&D	Research and development
SGP	Stability and Growth Pact
VAT	Value-added tax

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This Survey is published on the responsibility of the Economic and Development Review Committee (EDRC) of the OECD, which is charged with the examination of the economic situation of member countries.

The economic situation and policies of the euro area were reviewed by the Committee on 23 October 2006. The draft report was then revised in the light of the discussions and given final approval as the agreed report of the whole Committee on 13 December 2006.

The Secretariat's draft report was prepared for the Committee by David Rae and Boris Cournède under the supervision of Peter Hoeller.

The previous Survey of the euro area was issued in September 2005.

BASIC STATISTICS (2005)

	Euro area	United States	Japan
LAND AND PEOPLE			
Area (thousand km^2)	2 456	9 167	395
Population (million)	313.6	296.4	127.8
Number of inhabitants per km^2	128	32	323
Population growth (1995-2005, annual average % rate)	0.4	1.1	0.2
Labour force (million)	147.9	149.3	66.5
Unemployment rate (%)	8.6	5.1	4.4
ACTIVITY			
GDP (billion USD, current prices and exchange rates)	9 947.6	12 397.9	4 559.0
Per capita GDP (USD, current prices and PPPs)	29 848	41 789	30 541
In per cent of GDP:			
Gross fixed capital formation	20.5	19.5	23.2
Exports of goods and services	20.2	10.5	14.3
Imports of goods and services	19.1	16.2	12.9
PUBLIC FINANCES (per cent of GDP)			
General government:			
Revenue	44.5	32.7	30.3
Expenditure	47.5	36.6	37.0
Balance	–2.4	–3.7	–5.2
Gross public debt (end-year)	77.5	61.8	173.1
EXCHANGE RATE (national currency per euro)			
Average 2005		1.24	136.9
October 2006		1.26	149.7

EURO AREA – EXTERNAL TRADE IN GOODS (main partners, % of total flows, in 2004)

	Exports	Imports
Denmark, Sweden, United Kingdom	22.9	17.4
New European Union member countries	11.0	9.8
Other Europe	16.8	15.9
OECD America	17.4	12.6
OECD Asia/Pacific	5.5	8.6
Non-OECD dynamic Asian[1] and China	7.8	14.4

1. Chinese Taipei; Hong Kong, China; Indonesia; Malaysia; Philippines; Singapore and Thailand.

SHARE IN EURO AREA GDP

Current market prices, 2005