ECB OBSERVER

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The Fed and the ECB – why and how policies differ

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CONTENTS

SUMMARY (German)

Teil 1: Das US Federal Reserve System und das Europäische System der Zentralbanken – ausgewählte Aspekte im Blickfeld

1. Gemäss ihrem Zielkatalog hat die Fed Fürsorge für maximale Beschäftigung, stabile Preise und moderate Langfristzinsen zu tragen. Das primäre Ziel der EZB ist hingegen die Bewahrung der Preisstabilität. Die Unterschiede zwischen den Politikzielen der beiden Zentralbanken erklären ganz entscheidend die Unterschiede, die zwischen den beiden Geldpolitiken zu beobachten sind.
2. Vor dem Hintergrund potentieller Konflikte im Zielkatalog der Fed dürfte es vor allem das hohe Reputationskapital der Fed sein – verkörpert durch den Chairman Alan Greenspan –, dem eine essentielle Rolle für die Erklärung des Stabilitätserfolgs der US-Notenbank zuzuweisen ist.
3. Die Glaubwürdigkeit der EZB beruht hingegen vor allem auf dem institutionellen Rahmen – Notenbankverfassung und Zielsetzung –, der versucht, geldpolitische Zielkonflikte von vornherein auszuschalten. Dieser institutionelle Rahmen ist es auch, der es der EZB erlaubt, eine weitaus „entpersonalisiertere" Geldpolitik zu verfolgen als die Fed.

Teil 2: Die Reaktionsfunktionen der Fed und der EZB

1. Die Fed verfügt über keine explizit verkündete Strategie. Konzeptionell betrachtet trägt die Fed-Geldpolitik Züge einer „(Real-)Zinssteuerung". Ihr geldpolitisches Reaktionsmuster kann im wesentlichen durch Änderungen in der aktuellen Inflation und der Arbeitslosigkeit erklärt werden.
2. Die EZB hat eine geldpolitische Strategie formuliert und ist bestrebt, diese der Öffentlichkeit zu erklären. Bislang war jedoch ihre Zinspolitik weniger durch die Strategie-Empfehlungen als vielmehr durch die aktuelle Inflation bestimmt.
3. In den betrachteten Zeiträumen haben sich die Geldpolitiken der Fed und EZB vor allem von aktuellen Entwicklungen leiten lassen. In Kern haben sie damit zu wenig vorausschauend agiert; ihre Zinspolitik haben sie meist erst dann geändert, wenn Zielverfehlungen auftraten.

Teil 3: Der Einfluss der Geldpolitik auf die Konsumentenpreise

1. Niedrige Inflation und schwaches Wachstum in einer Vielzahl von Euro-Raum-Ländern haben Rufe nach einer Erhöhung der von der EZB gerade von tolerierbaren Inflation in Höhe von 2,0-Prozent provoziert. Wenn die Kosten und Nutzen einer Erhöhung der bisherigen Zieldefinition sorgsam abgewogen werden, finden wir keine überzeugende Rechtfertigung für die Forderung nach einer Erhöhung der Obergenze für die zulässige Inflation im Euro-Raum.
2. Empirische Analysen zeigen, dass die Inflation der US-Konsumentenpreise durch das „Output-Gap" erklärt werden kann. Eine Geldpolitik, die sich eines Geldmengenaggregates als (Zwischen-)Zielgrösse der Geldpolitik bedient, stellt keine valide Politikoption in den USA dar.
3. Anders im Euro-Raum. Hier kann die Inflation der Konsumentenpreise überzeugend durch die Geldmenge bzw. das „Price-Gap" erklärt werden. Folglich ist es rational, dass die EZB – anders als die Fed – der Geldmenge eine prominente Rolle in ihrer Geldpolitik beimisst.

Teil 4: Ausblick auf Inflation im Euro-Raum und EZB-Zinspolitik

1. Es sind drei Gründe, die die EZB in den kommenden Monaten zu Zinserhöhungen bewegen werden: (a) Die sich aufhellenden Konjunkturperspektiven lassen den M3-Überhang nunmehr als Risiko für die künftige Preisstabilität erscheinen. (b) Die EZB wird – eher früher als später – die Zinsen erhöhen, um die Risiken zu reduzieren, dass das Inflationsziel möglicherweise im dritten Jahr in Folge verfehlt wird und dass – damit einhergehend – (c) ihre Reputation als „Inflations-Bekämpfer" ernstlich in Frage gestellt wird. Wir gehen davon aus, dass die maximale Erhöhung des EZB-Refi-Zinses bis Ende diesen Jahres 50bp betragen wird.
2. Wir erwarten, dass sich die Inflation weiter abschwächt und sich in 2003 auf eine Jahresrate von 1.6% einpendelt; die EZB wird ihren Stabilitätsauftrag damit erfüllen.
3. Die Glaubwürdigkeit des Disziplinierungsdrucks des Europäischen Stabilitäts- und Wachstumspaktes hat gelitten, als der ECOFIN-Rat darauf verzichtete, Deutschlands Defizitabweichung zu ahnden. Auch die jüngsten Aufweichungsversuche stellen, wenn ihnen nicht entschieden entgegen getreten wird, mittel- bis langfristig eine ernstzunehmende Gefahr für den Stabilitätserfolg der EZB dar.

SUMMARY (English)

Part 1: The US Federal Reserve System and the European System of Central Banks – selected issues under review

1. Whereas the Fed has to promote "*effectively the goal of maximum employment, stable prices and moderate long-term interest rates*", the ECB's primary objective is to maintain price stability. The differences in policy objectives can, to a large extent, be held responsible for the differences in the conduct of monetary policy between the two central banks.
2. In view of the inherent potential conflicts between its policy objectives, the Fed's reputation capital, embodied by Fed Chairman Alan Greenspan, seems to play an essential role in explaining the success of the Fed's monetary policy in terms of stabilisation.
3. The ECB's credibility basically rests on an institutional framework designed to rule out conflicts of objectives. The ECB's explicit policy objective and strategy allow the bank to pursue a much more "depersonalised" monetary policy than that of the Fed.

Part 2: The reaction functions of the US Fed and ECB

1. The Fed does not have an explicitly announced policy strategy. Conceptually, the Fed policy bears an affinity to "interest rate steering". The Fed policy reaction function can largely be explained by actual inflation changes and by changes in the unemployment rate.
2. The ECB has devoted considerable effort towards designing a monetary policy strategy. However, the rate setting seen so far from the bank has largely been driven by current inflation. This policy reaction can largely be explained by the new bank's need to build up reputation capital.
3. In the period under review, both central banks have focused their policy too much on the immediate present rather than pursuing a systematically pre-emptive monetary policy.

Part 3: The influence of monetary policy on consumer prices

1. Low inflation accompanied by lacklustre growth in numerous Euro zone countries has provoked calls for an increase in the 2.0 percent upper ceiling of the ECB's price stability definition. However, weighing the costs and benefits resulting from an increase in the 2.0 percent upper range of the ECB's price stability definition, we do not find convincing support for such a claim.
2. Changes in US consumer prices can largely be explained by changes in the output gap. According to empirical evidence, a monetary policy based on monetary aggregates is not a valid option in the US.
3. In the Euro zone, inflation is mainly driven by the "price gap". Consequently, it is rational that the ECB has assigned a prominent role to money in its policy strategy.

Part 4: Inflation and ECB rate policy perspectives

1. From November 2001 to June 2002, the ECB policy was fully in line with the central bank's stability mandate.
2. In view of the ECB's concerns about the risk of missing its annual inflation ceiling for the third consecutive year and, more importantly, defending its established credibility in fighting inflation, we expect the ECB to raise rates slightly by 50bp by the end of 2002. Moreover, in view of improving growth perspectives, there is reason for the ECB to be concerned about the inflationary impact represented by the M3-overhang. We expect inflation to move towards 1.6% in 2003.
3. The credibility of the European Stability and Growth Pact ("Pact") has been damaged following the ECOFIN's decision not to issue an early warning to Germany and, more recently, further political attempts to water down the Pact's obligations. This, in turn, could seriously undermine the ECB's stability efforts.

Part 1: The US Federal Reserve System and the European System of Central Banks – selected issues under review

CONTENT: *1. Historical backgrounds. – 2. Independence and policy objectives. – 3. Strategies.*

1. Historical backgrounds

The *Federal Reserve System (Fed)* was established in 1913. The emergence of the Fed was a consequence of national legislation by the American Congress, which provided for the creation of a central bank for the United States. For two brief periods before that, the country had had a central bank, whose duties included the issue of banknotes. The Bank of the United States (BUS) refers to two private, national banks that played a significant economic role for the US during the early 1800's. Both the First Bank of the United States, chartered in February 1791, and Second Bank of the United States, founded in 1816, greatly stimulated business, assisted public credit, and encouraged other banks to comply with standard procedures.[1]

These institutions, however, faced criticism from many groups who accused them of being corrupt and monopolistic. After Congress had ignored two previous recharter bills, legislators reviewed a petition for the BUS recharter in 1811. Opinions on the BUS were based more heavily on personal interests than those of political parties. Despite many protests, the First Bank of the United States was forced to close in 1811 with the fatal vote being cast by Vice President Clinton. In 1836, President Jackson issued the Specie Circular, which required all public land to be bought in specie only. This greatly hurt the Second Bank of the United States by diminishing its stock of bank notes. The bank started wrapping up its business by stopping loans and collecting on all outstanding loans. The BUS branches were sold to other state banks. Finally, the BUS closed for business in March 1837.

The American Civil War (1861-1865) was followed by the so-called "National Banking Period" (1863-1913), when "national banks" established by the federal government were authorised to issue banknotes. However, these institutions were unable to develop into fully-fledged central banks, largely because of the hostile attitude of the American public towards anything remotely resembling central power. Although the dollar was actually introduced as single currency in 1792, it took almost another 125 years before a fully-fledged currency area with a central monetary authority could be realised.

The Fed model endeavoured to strike a balance between regional states' interests and those of the federal authorities. The first twenty years of the Fed's existence were marked by a multitude of internal policy conflicts. For instance, as a result of the depression of the late twenties, banking legislation was radically amended. Pursuant to the banking act of 1933, the so-called "Federal Open Market Committee" (FOMC) was set up, which commenced functioning two years later and developed into an outstanding monetary policy body. Subsequently, the Bank Act of 1935 provided for a central management structure in Washington D.C., now embodied by the "Board of Governors", which has a majority vote in that body. Thus, with this move the centralisation of decision-making in the central banking system of the United States became a fact.

[1] For an overview of US banking history see http://www.salinasapushistory.com/bank_of_the_united_states.htm.

Fig. 1: The US Federal Reserve System and the ESCB/Eurosystem

The US Federal Reserve System	**The European System of Central Banks (ESCB)**
Board of Governors of the Federal Reserve System (7 members). *Federal Open Market Committee* (Board of Governors of the Federal Reserve System plus 5 Presidents out of the 12 *Federal District Banks*; the President of the Fed in New York is a permanent member).	*European Central Bank (ECB) Executive Board* (President, Vice President and up to four members). *ECB Governing Council* (ECB Executive Board and the Presidents of the National Central Banks (NCBs)). *General Council of the ECB* (President, Vice President and the governors of all 15 Member States).
The twelve districts represented by the Federal District Banks are as follows (with the states covered by each district in parentheses): 1. Boston (Maine, New Hampshire, Vermont, Rhode Island, Connecticut); 2. New York (New York, Connecticut), 3. Philadelphia (New Jersey, Pennsylvania, Delaware, District of Columbia), 4. Cleveland (Ohio, Kentucky, West Virginia, Pennsylvania), 5. Richmond (South Carolina, North Carolina, Virginia, West Virginia, Maryland), 6. Atlanta (Florida, Georgia, Alabama, Mississippi, Tennessee, Louisiana), 7. Chicago (Iowa, Illinois, Michigan, Wisconsin), 8. St Louis (Arkansas, Mississippi, Tennessee, Kentucky, Indiana, Illinois, Missouri), 9. Minneapolis (Montana, North Dakota, South Dakota, Minnesota, Wisconsin, Michigan), 10. Kansas City (Wyoming, Colorado, New Mexico, Nebraska, Kansas, Oklahoma, Missouri), 11. Dallas (Texas, New Mexico, Louisiana), 12. San Francisco (Washington, Oregon, California, Nevada, Idaho, Utah, Arizona, Alaska, Hawaii).	*NCB*: 1. Austria – Oesterreichische Nationalbank 2. Belgium – Banque Nationale de Belgique 3. Finland – Suomen Pankki 4. France – Banque de France 5. Germany – Deutsche Bundesbank 6. Greece – Bank of Greece 7. Ireland – Central Bank of Ireland 8. Italy – Banca d´Italia 9. Luxembourg – Banque centrale du Luxemburg 10. The Netherlands – De Nederlandsche Bank 11. Portugal – Banco de Portugal 12. Spain – Banco de Espana 13. Denmark – Danmarks Nationalbank 14. Sweden – Sveriges Riksbank 15. United Kingdom – Bank of England Note: *European System of Central Banks* (ESCB) = Eurosystem plus Danmarks Nationalbank, Sveriges Riksbank and Bank of England. *Eurosystem* = European Central Bank (ECB) plus European national central banks (NCBs) of countries that have adopted the euro.

Source: De Nederlandsche Bank, A comparative study of the Federal Reserve System and the ESCB, in: Quarterly Bulletin March 2001.

The emergence of the *European System of Central Banks (ESCB)* reflects an almost fifty-year long, but not yet completed, pursuit of European economic and political integration. The cornerstone was laid with the establishment of the supranational European Coal and Steel Community in 1950. A new milestone in the process was the foundation of the European Economic Community in 1957, which was intended to further political unification by economic means, although that Community only had the potential for a supranational character. The "Werner Plan" of 1970 provided for a gradual realization of Economic and Monetary Union (EMU) with community and, eventually, fully supranational institutions in the fields of monetary and fiscal policy. After this plan had fallen through in the early 1970s, Western European (monetary) integration gained new momentum in March 1979 with the introduction of the European Exchange Rate Mechanism.

The attempts to create an internal market reinforced the call for a single currency. The otherwise cumbersome process of integration suddenly gained momentum when, in 1989, the fall of the Berlin Wall obliterated the political dichotomy in Europe. France and Germany, which from the outset had been the driving forces behind the post-war process of European integration, reached a political compromise in which the unified Germany met, inter alia, French demands for a reduction in the hegemony of the monetary policy of the Deutsche Bundesbank through the foundation of a supranational European Central Bank (ECB).[2] This

[2] Throughout this text we use "Eurosystem" and "ECB" interchangeably.

compromise was reflected in the Treaty of Maastricht ("Treaty"), concluded in December 1991. The ECB, however, was designed with a very close eye on the institutional framework of the Deutsche Bundesbank. At the heart of the Treaty is EMU, which entered its third and final phase on 1 January 1999. Given the political constellation of the European Union, it is obvious that the ESCB is a uniquely European model.

Fig. 2: Distribution of Fed districts and EMU member states

Percentage of GDP	Fed districts	EMU countries
0 –5	1	7
5 –10	10	2
10 – 15	-	-
15 – 20	1	1
20 – 30	-	1
> 30	-	1
Number of members	12	12
Total GDP (EUR billion)	*10,015*	*6,217*

Source: De Nederlandsche Bank, A comparative study of the Federal Reserve System and the ESCB, in: Quarterly Bulletin March 2001, p. 57.

The individual significance of the Fed districts in the United States and of the national member states of the EMU in terms of GDP volume is shown in Fig. 2. The establishment of the regional Federal Reserve Districts originally resulted from a deliberate political decision that they should not correspond to the states of the American federation. Each district was originally allocated around one-twelfth of GDP a share that, in some cases, has radically changed since 1913, due to the individual districts having different trends in terms of economic and population growth. However, this has not altered the fact that even now ten out of the twelve districts still fall into the 5-10% category, while only one district, San Francisco, which accounts for 20% of American GDP, may be called truly significant. Unlike the United States, economic power in the Euro zone, in terms of GDP, is very unevenly spread in geographical terms. Although, as in the United States, the majority of member states can be classed as 'small', three large countries (Germany, France and Italy) stand out, accounting for more than 70% of GDP in the Euro zone. This picture is reinforced by the dominant position of Germany with its share of almost 32%, while Germany and France jointly produce more than half of the EMU's GDP.

2. Independence and policy objectives

According to Debelle and Fisher (1995, p. 197), central bank independence can be characterized in terms of (i) "goal independence" and (ii) "instrument independence".[3] While the former provides the central bank with the authority to determine its primary policy objectives, the latter allows the bank a free choice of the instruments it will use to achieve its policy objective(s). Moreover, in Grilli et al (1991), a distinction can be made between "political" and "economic" central bank independence. Below, we examine the major issues determining the independence of the US Fed and the ECB.

[3] For further details see THE ECB OBSERVER, Inflationsperspektiven im Euro-Raum, 17 April 2001. See in this context also the analysis of *Ruckriegel, K., Seitz, F.* (2002), The Euro System and The Federal Reserve System Compared: Facts and Challenges, in: ZEI Working Paper.

The Fed is a politically independent central bank in so far as its decisions are not subject to the approval of the President of the United States. It is accountable, however, to Congress. Democratic embedment is thus ensured. Moreover, as it generates its own income, the Fed is not like other government agencies dependent on a budget allocated by the government and controlled by Congress. However, the Fed's political independence is less absolute than it may seem. In fact, the bank must conform to the economic policy framework imposed by the administration. As Congress may alter the legislation at any time, it is widely believed that the Fed has a strong incentive for its monetary policy to not deviate too much from the views of the members of Congress: the Chairman may feel a strong bond with the US President. At this juncture, it should be noted that the American president not only exercises an influence on the Fed's policy through Congress, but also – as in the case of the appointment of justices of the Supreme Court – through his power to appoint the 'Board of Governors'. However, this influence should not be overestimated.

In the Euro zone, the Treaty and its Statute have assigned the ESCB/ECB a very high degree of political and economic independence: the ECB has been described as the world's most independent central bank. For instance, the ECB policy decision makers may not seek or take instructions from Community institutions or national bodies. Moreover, the ECB and the NCBs generate their own income, securing their financial independence. Like the Fed, the ECB can freely choose which instruments to implement to achieve its policy objectives. An important aspect determining the ECB's independence is definitely the fact that its objective and/or Statute can only be changed by a unanimous decision by the 15 European countries. In this context, it should be noted that the ECB, like any other central bank, has an "open flank": the Ecofin Council may decide to agree exchange rate mechanisms with non-EU countries and to adopt general directions for the Euro zone's exchange rate policy.[4] In 1997, however, the European Council resolved that these general directions should be resorted to only in exceptional situations.

Neither the US Fed nor the ECB enjoy "goal independence" but pursue objectives set by governments. As defined in the *Federal Reserve Act* of 1913 and the provisions added in 1977, the task of the Fed and the FOMC consists of promoting *"effectively the goal of maximum employment, stable prices, and moderate long-term interest rates*" (where the latter is likely to be a corollary of price stability). It is down to the Fed itself to interpret these terms, although it has not (yet) provided the general public with a clear-cut specification of its policy objectives. "Maximum employment" could be interpreted as bringing the unemployment rate as low as possible without pushing it below what economists call the natural rate or the full-employment rate.[5] By pushing unemployment below that level the Fed would be afraid of causing inflation to rise, which runs counter to its objective of delivering stable prices.

The objective of promoting stable prices has not been "well defined", either in legal terms or by the Fed itself. Congress has not told the Fed to keep the consumer price index (CPI) at zero percent growth, nor to target the producer price index, nor the GDP deflator, nor to pursue any other particular index. The Fed is believed to view price stability as a situation in which economic decisions are not disrupted by expectations regarding inflation for the US. It has adopted this course not only by virtue of its mandate from Congress, but also on ac-

[4] It is well known that a monetary policy, which is obliged to target a certain exchange rate level may, under certain circumstances, be unable to pursue a policy focused on price stability.

[5] This rate of unemployment is often referred to as NAIRU ("non-accelerating inflation rate of unemployment").

count of the personality of its chairman, Mr. Greenspan: in fact, he embodies a guarantee of the entire system's credibility. Quantitative targeting is certainly being considered in Fed circles. As things stand, however, it is generally thought that there is insufficient support for such a policy line within the Board, partly out of fear that Congress might take this to be in conflict with the mandate given.

From the point of view of monetary policy theory, one is inclined to conclude that the Fed is forced to pursue a kind of nominal GDP targeting ("hybrid targeting").[6] Such a mix of objectives, however, may not be entirely free of potential problems. Pursuing both low inflation and maximum employment represents a complementary objective function as long as the economy is subject to positive or negative demand side shocks. In such a situation, the central bank should be able to deliver on both objectives without having to compromise either of them. If, however, the economy is subject to a negative or positive supply side shock, the central bank must assign a priority to one of the two objectives, e.g. seek a trade-off between output and price stabilization. Thus, nominal GDP targeting may, under rational expectations, run the risk of creating the well known "time inconsistency problem". In view of inflation trends in the US and inflation expectations, however, the Fed appears to have been able to convince markets that it is not intending to compromise its price stability objective in favour of the employment and output target at any time.[7]

The ECB's mandate has been clearly defined in the Treaty and the ECB/ESCB-Statute. Under the Treaty, the primary objective of the single European monetary policy is to maintain price stability in the Euro zone. Without prejudicing this objective, the System supports the general economic policies of the Community. The ECB Governing Council defines price stability as a year-on-year increase of less than 2% in the Harmonized Index of Consumer Prices (HICP) for the Euro zone. Price stability according to this definition is to be maintained over the medium term. Whereas the Fed has, de facto, to assign equal priority to both of its objectives, the ECB's primary objective is price stability. In fact, the design of the ECB's set of objectives actually aims to prevent the emergence of the time-inconsistency problem in monetary policy.

The objective of price stability and that of supporting growth and employment are by no means exclusive policy goals. Empirical findings from numerous countries provide strong evidence that price stability is actually conducive to sustainable growth and employment. A monetary policy that secures low and stable inflation can thus be interpreted as a monetary policy supporting growth and employment. Against this background, the ECB's primary objective of maintaining price stability should be interpreted as a means for paving the way towards the "ultimate goal", that is to say supporting growth and employment. For the Fed, on the other hand, which has to pursue two objectives simultaneously, inflation is a cost, e.g. utility determining, factor which has to be weighted against the costs and benefits of the employment objective.

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6 In view of the close relationship between the labour market and output, we are inclined to consider the employment and output objectives as being complementary.

7 We derive this conclusion from the analysis of "break even inflation" in the US-TIPS ("Treasury Inflation Protected Securities") market.

3. Strategies

A monetary policy strategy describes the general framework that guides the setting of the central bank's operating target – usually the official interest rate – in order to achieve its final policy objective(s). More specifically, a strategy would relate changes in the central bank's operating target to (various) indicator variables. A monetary policy strategy may serve several (productive) purposes. Firstly, it helps communicate the central bank's policy decisions, making policy actions more transparent to the outside world, and thereby improving the predictability of monetary policy. Furthermore, a strategy increases the bank's accountability, which, in turn, should strengthen the public's confidence in the rectitude of monetary policy. Finally, announcing a policy strategy and bringing actual policy actions into line with the yardstick(s) chosen subjects policy makers to a kind of disciplinary corset which may help to organize and increase the efficiency of internal decision making.

A rational monetary policy is based on the assumed influence that the money supply and central bank rates exert on the central bank's policy objectives. In addition, a policy strategy has to take into account specific characteristic factors of the economy such as, for instance, the structure of the financial system, the role that capital markets play in matching savings and investment and, in some circumstances, the economy's monetary policy traditions. In view of these restrictions it is hardly surprising that the strategies of the Fed and ECB differ widely in a number of respects.

The Fed has not (yet) released any formal strategy concept. In view of the bank's policy history, the Fed seems to follow a strategy of "looking–at–everything". From a conceptual point of view there seems to be some evidence that the Fed may be pursuing a kind of "(real) interest rate steering" (IRS). Under IRS, the central bank sets a real (short-term) interest rate to keep the economy at potential output (the relationship between real interest rates and output growth is illustrated in Box 1). The rate that balances supply and demand at potential output is often referred to as the economy's "neutral interest rate" (see, for example, Blinder, A. [1999], pp. 31). A real interest rate below the neutral interest rate will stimulate aggregate demand, leading to actual GDP exceeding its potential level, thereby causing prices to rise. Conversely, a real rate above the neutral level will ultimately be contractive and disinflationary. Thus, IRS assumes that price stability will prevail if the economy is at potential output.[8]

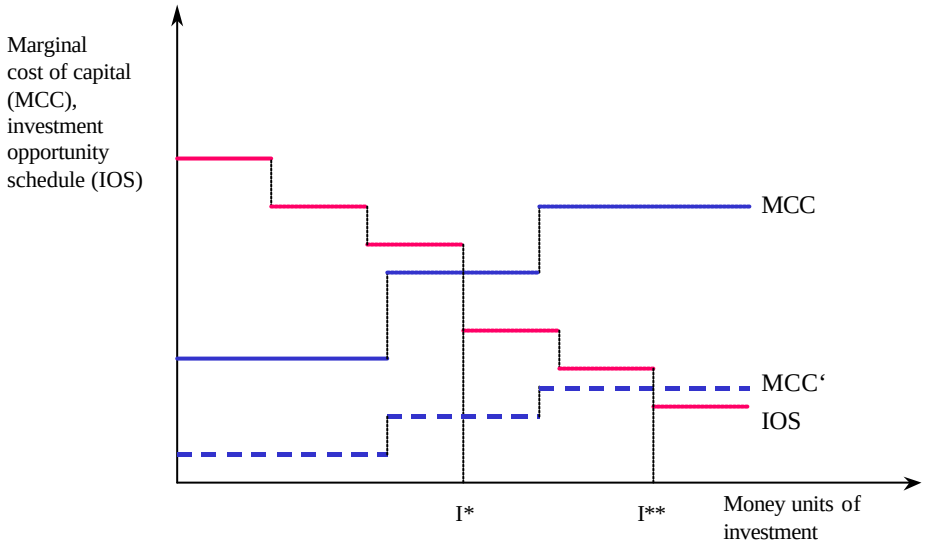
The impact that a central bank is assumed to have on the real economy under IRS can easily be illustrated by looking at a firm's capital budgeting decision.[9] Fig. 3 shows a firm's investment opportunity schedule (IOS), which is a line representing the firm's investment opportunities, with the projects having the highest returns plotted first. The marginal cost of capital (MCC) schedule is defined as the cost of the last money unit that the firm raises. The MCC schedule increases as the firm raises more and more capital during a given period. If the

[8] In essence, IRS is based on the neoclassical "Wicksell" approach (Knut Wicksell [1851–1926]). Wicksell made a distinction between the "natural rate of interest" and the "market interest rate". Whereas the former is determined by the real economy and ensures that saving and investment are appropriately matched, the latter is set by the central bank. If the market interest rate should be below the natural rate, then people will save too little and businesses will invest too much; the economy expands. If the market rate is above the natural rate, then people will save too much and businesses will invest too little; the economy contracts. According to Wicksell, the natural rate and the market interest rate should show a tendency to converge over time. As the central bank can change the market rate relative to the natural rate, it is believed that monetary policy can affect the state of the business cycle.

[9] This line of thought can be traced back to Dean, J. (1969), Capital Budgeting, 8th Print, New York.

MCC schedule is combined with the IOS, the intersection defines the firm's cost of capital and the optimum level of investment . For a given IOS, the lower the MCC the higher will be the firm's investment volume. Therefore, if the central bank succeeds in lowering a firm's MCC it can influence the level of investment and thereby employment and aggregate output.

Fig. 3: Monetary policy impact under interest rate steering: combining a firm's marginal cost of capital (MMC) schedule and its investment opportunity schedule (IOS)



MMC represents a firm's marginal cost of capital. The line increases as more and more capital is raised in a given period. The IOS represents the firm's investment opportunities schedule, with the projects having the highest returns plotted first. The intersection of MCC and IOS yields the investment volume I. If, for instance, the central bank can lower the firm's cost of capital from MCC to MCC', the investment volume would increase from I* to I**. To exert an influence on the real economy, it is thus crucial for the central bank to be able to affect the firm's cost of capital relative to the firm's expected returns on investment. For further reading, see corporate finance literature, such as Brigham, E. F. (1989), Fundamentals of Financial Management, 5th Edition, Chicago et. al.*

Box 1: The relationship between the real interest rate and output growth

Using a Cobb-Douglas production function, the economy's output O in a period is a function of capital C, labour N, and the state of technological efficiency ß:

(1) $O = O(C, \overline{N}, \overline{\beta}) = f(C)$ where $f'(C) > 0,\ f''(C) < 0.$

The return on capital, R_C, can be expressed as the multiplication of output by its price, P:

(2) $R_C = O \cdot P = f(C) \cdot P$.

In a simple world, firms' aggregate return equals the economy's nominal output:

(3) $R_C \equiv Y_n$.

Assuming that the output price equals the economy's price level, the firms' nominal output equals the economy's nominal GDP:

(3) $Y_n = Y_r \cdot P \equiv R_C = f(C) \cdot P \ \left(\text{real GDP} \Rightarrow Y_r = O = f(C)\right).$

The price of new capital can be stated as a function of the price of capital P_C, the units of capital C, and the market interest rate (e.g. opportunity cost), i:

(4) $C_C = P_C \cdot C \cdot i$.

The economy's maximum profit can be expressed as:

(5) $X = R_C - C_C = Y_n - C_C \rightarrow \max!$ which corresponds to:

(6.1) $Y_n' = \frac{dY_n}{dC} = \frac{dC_C}{dC} = C_C'$.

Using equations (3) and (4) gives:

(6.2) $\frac{dY_r}{dC} \cdot P = f'(C_{opt}) \cdot P = P_C \cdot i$.

The optimum level of investment can be calculated as the difference between the optimum and actual investment stock:

(7) $I = C_{opt} - C_{act} = f'^{-1}\left(\frac{P_C \cdot i}{P}\right) - C_{act}$.

The "marginal efficiency of capital" is:

(8) $i_r = \frac{P \cdot dY_r}{P_C \cdot dC} = \frac{P}{P_C} \cdot f'(C)$.

Solving (6.2) for i gives:

(9) $i = \frac{P \cdot dY_r}{P_C \cdot dC} = \frac{P}{P_C} \cdot f'(C_{opt})$.

It follows from (8) and (9) that the marginal efficiency of capital equals the market interest rate ($i_r = i$) if the actual investment stock equals the optimum investment stock. Assuming that the marginal efficiency of capital is de facto the economy's growth rate, in equilibrium the market interest rate equals the economy's growth rate.

Source: Woll, A. (1981), Allgemeine Volkswirtschaftslehre, 7. Aufl., pp. 356.

The merits of IRS have been widely discussed in economic literature.[10] Most importantly in this context, there are convincing arguments that IRS would not succeed in stabilising the price level if the economy were subject to positive and negative demand or supply side shocks. However, IRS may provide an alternative strategy to a policy focused on the money supply if the demand for money function were to become unstable. In contrast to a policy focused on monetary aggregates, IRS represents a rather discretionary monetary policy. The

[10] Most of these analyses refer to the "Poole model" which is based on a traditional Keynesian framework, drawing no distinction between long-term and short-term and real and nominal interest rates (see *Poole, W.* (1970), Optimal Choice of Monetary Policy Instruments in a Simple Stochastic Macro Model, in: Quarterly Journal of Economics, Vol. 48, No 1, pp. 197 – 216).

reason for this is that, under IRS, the central bank would have to response to cyclical developments rather than trends in the economy: the central bank would try to adjust real short-term rates to cyclical changes in real output. Given long and variable time lags, such a discretionary monetary policy runs the risk of causing unfavourable pro-cyclical swings. Moreover, IRS requires that monetary policy is able to exert a systematic influence on the real economy, a proposition that is still hotly debated in academic circles.

In addition, there are a number of yet unresolved issues related to IRS. For instance, IRS requires that the central bank can, by way of its short-term rate, affect the interest rate responsible for keeping the economy at potential output; however, this rate is presumably the long-term rather than the short-term rate. Moreover, the question of how to measure an economy's "marginal efficiency of capital", which is required to bring real interest rate costs in line with the economy's potential expansion rate, is also unresolved. In summary, without answers to these pressing questions, from a theoretical viewpoint there remain serious problems in recommending an IRS monetary policy strategy .

The design of the Eurosystem's monetary policy strategy required an appreciation of the environment in which the Eurosystem operates. This environment imposes certain constraints on the single monetary policy. It is useful to make a distinction between three categories of constraints: economic, institutional and practical. Firstly, in formulating its strategy the Eurosystem had to acknowledge the capabilities and limitations of monetary policy as implied by both general economic principles and by the structure of the Euro zone economy. Secondly, the Eurosystem had to make sure that its strategy would ensure a policy in accordance with the mandate, tasks and powers assigned to it by the Treaty. Finally, the monetary policy strategy of the Eurosystem had to reflect practical constraints, many of which arise because of the uncertainties created by the shift in the regime associated with the transition to Monetary Union.

The ECB's monetary policy strategy consists of two elements. Firstly, there is an explicit definition of the bank's price stability objective; secondly the bank has specified two "strategy pillars" which are intended to guide policy actions.[11] The quantification of the ECB's primary monetary policy objective is intended to serve as a guide for inflation expectations and to provide a framework within which the Eurosystem can be held accountable. To maintain price stability according to this definition, monetary trends are closely monitored in relation to a quantitative reference value for monetary growth ("first strategy pillar"). The reference values for 1999, 2000, 2001 and 2002, indicating the annual money supply growth rate that is compatible with price stability, have been set at of 4½% for the broad aggregate M3. Consistent with the medium-term focus of the strategy, the reference value is calculated using assumptions with regard to (i) potential growth of real GDP, (ii) the trend in the change of velocity money and (iii) the envisaged inflation. In parallel with this monetary analysis, a broadly based assessment of the outlook for price trends in the Euro zone is carried out ("second strategy pillar"). This assessment encompasses a wide range of indicator variables, including inflation projections produced both inside and outside the Eurosystem.

From a conceptual point of view, the ECB's first strategy pillar follows Monetarist thinking, suggesting that inflation is "always and everywhere a monetary phenomenon". In view of potential instabilities in the demand for M3 in the short-run, however, the ECB has made clear

[11] On 13 October 1998, the Governing Council of the European Central Bank (ECB) announced the main elements of its monetary policy strategy focused on stability. In a number of statements, the ECB has included the explicit announcement of its price stability definition as part of its policy strategy. In other documents, however, the announcement of its primary objective is not included in the description of its policy strategy.

that it would not "slavishly" follow the signals provided by the reference value concept but would retain a certain degree of discretion in interpreting actual money expansion. The second pillar of ECB strategy is actually based on the assumption that inflation is also driven by "real economic" phenomena. Analysing the variables contained in the second strategy pillar may provide the ECB with additional information regarding (short to medium-term) fluctuations in the Euro zone price level.

The first strategy pillar has been subject to extensive analysis with regard to its impact on future inflation. It has been found that M3 can provide a relatively good explanation of Euro zone inflation. M3 represents a reliable inflation indicator if the information content of M3 is extracted by applying the "real money gap" or, correspondingly, the "price gap" concept. In contrast, there is still a great degree of uncertainty about the actual influence the variables in the second pillar exert on future Euro zone inflation. This lack of empirical evidence could be problematic, especially in times of heightened uncertainty, if monetary policy makers are inclined to base their decisions on the variables from the second pillar rather than on the long-term signals provided by the first pillar.

The Fed policy enjoys a high level of support both from academic circles and the financial markets at large. In view of its policy results – that is low inflation and high growth – the Fed does indeed appear to have been relatively successful. Most notably, the Fed policy has been widely hailed for being able to keep market expectations on the course envisaged by policy makers: market agents seem to be able to anticipate forthcoming Fed policy actions very well in terms of their timing and magnitude. In view of potential conflicts between the Fed's policy objectives – namely the inherent risk of provoking the "time inconsistency problem" and the relatively large scope for discretionary policy actions characteristic of an IRS-type policy – the Fed's reputation capital, embodied in its Chairman Alan Greenspan and the highly regarded expertise of the FOMC members, seems to play an essential role in explaining the policy success enjoyed by the US central bank.

In its three-year history, the ECB has, more or less, been able to deliver on its price stability promise.[12] Most importantly, the new central bank seems to have succeeded in keeping the markets' inflation expectations below its envisaged 2.0 percent upper ceiling. However, the ECB's policy has been the subject of various criticisms. It has been argued, for example, that the bank has pursued a policy, which has not always been in line with the signals provided by its declared strategy. Moreover, there has been criticism from several quarters of the ECB's allegedly poor communication policy. It seems fair to say that many of the critical voices may, to a significant extent, have been motivated by a direct comparison of the ECB's policy with that of the Fed, which may be somewhat misleading given the differences in the central banks' policy objectives, the functioning of the respective economies and the countries' overall political structures. On balance, the ECB's policy objective and strategy certainly provide an adequate framework for conducting a successful monetary policy in the Euro zone.

[12] In 1999, the average rise of the Harmonized Index of Consumer Prices (HICP) was 1.1%, in 2000 2.3% and in 2001 2.5%.

Part 2: The reaction functions of the ECB and US Fed

CONTENT: *1. Central bank objectives and reaction functions – theoretical aspects. – 2. How the US Fed and the ECB have reacted – some empirical findings. – 3. Conclusions and outlook.*

1. Central bank objective and reaction functions – theoretical aspects

In economic literature, it is common to model the central bank objective function along the lines of a cost minimisation problem. Accordingly, the central bank aims to minimise the costs related to deviations of current inflation from the envisaged inflation $(\pi - \pi^*)$ and current output from potential output $(y - y^*)$:

$$(1) \qquad K = (1-\lambda)\cdot(\pi-\pi^*)^2 + \lambda\cdot(y-y^*)^2 \rightarrow \min!$$

where y and p represent output and inflation respectively, with asterisks standing for potential values; $0 \leq l \leq 1$. In a multi-period model, equation (1) can easily be rearranged to give:

$$(2) \qquad K = E_t \sum_{i=1}^{\infty} \delta^{-t} \left[(1-\lambda)\cdot(\pi-\pi^*)^2 + \lambda\cdot(y-y^*)^2\right] \rightarrow \min!$$

where E(.) is the expectation operator and δ the discount factor. If, for instance, $l = 0$ ($l = 1$), the central bank is pursuing a monetary policy strictly focused on inflation (output) stabilisation. In this case, deviations in output (inflation) do not have any cost effects and thus play no role in the central bank's objective function.

The central bank sets its policy instrument – the "operating target" – in a way that is compatible with achieving its objective(s). In modern central banking practise, the short-term interest rate has become the operating target of monetary policy. By way of setting short-term interest rates, the central bank determines the price of central bank money in the financial markets. As banks demand central bank money for at least three reasons (namely for (i) keeping minimum reserves, (ii) holding "working balances" and (iii) meeting non-banks' demand for cash), the central bank can be expected to affect banks' money and credit supply.

There is a widely held consensus that monetary policy can only have an indirect influence its final objective, that is to say output and/or inflation. Moreover, monetary policy actions feed through into the real economy with uncertain, e.g. variable, time lags. The recognition of the existence of time lags and the problem of time inconsistency should induce central banks to pursue a forward-looking policy. Under such a policy, the central bank would change its operating variable with respect to an intermediate variable, or a set of variables, which are considered to have a close and predictable relationship with the final objective of monetary policy. More formally, a simple central bank reaction function can be expressed as follows:

$$(3) \qquad \Delta i_t = f(\Delta x_1, \Delta x_2, \ldots \Delta x_n).$$

According to equation (3), the central bank changes its interest rate (Δi_t) in period t in response to changes in the variables $x_1, x_2, ...x_n$, which are expected to have an impact on future inflation and/or output.

Central bank reaction functions play an important role in macroeconomic and policy analysis. They can be helpful in predicting actual policy actions, thereby serving as a benchmark for assessing the current stance and the future direction of monetary policy. Below, we (1) take a closer look at the underlying idea of the "Taylor Rule", which enjoys a prominent position in monetary policy analysis, and (2) highlight the major differences between monetary policy based on the Taylor rule and on Monetary Targeting (MT) .

Re (1): Reaction function based on the "Taylor Rule"

Under the "Taylor Rule" (J. B. Taylor [1993]), the central bank sets the level of the nominal short-term interest rate in response to the actual inflation and output situation.[13] According to the "Taylor rule", the central bank should change interest rates in response to the "inflation-gap" and the "output-gap". The "Taylor interest-rate" is calculated as follows:

$$i_t = r^* + Dp^e_{t+1} + a_y \cdot (Dy_t - Dy^*) + a_p \cdot (Dp_t - Dp^*),$$

where
- i_t = nominal Taylor rate in period t,
- r^* = real equilibrium rate,
- Dp^e_{t+1} = (expected) inflation (in period t+1),
- Dy_t = actual real output growth,
- Dy^* = trend output growth,
- Dp_t = actual inflation rate,
- Dp^* = target inflation rate and
- a_y, a_p = weightings for the output gap $(Dy_t - Dy^*)$ and inflation gap $(Dp_t - Dp^*)$ respectively.

Note that with the exception of the interest rate, lower case letters stand for logarithms, and Δ for first differences, e.g. growth rates. According to the equation above, the central bank raises (reduces) the nominal interest rate if (i) actual output increases above potential, and/or (ii) actual inflation exceeds expected inflation and/or (iii) inflation expectations in the period t+1 increase.

The Taylor rule has been recommended as a viable monetary policy strategy. However, a critical examination reveals that the Taylor rule may be a much less convincing concept than it may first appear. For one thing, the Taylor rule does not actually qualify as an intermediate policy strategy as it merely adds the real growth objective to the inflation objective of monetary policy. Not only is this very much contradictory to the widely accepted "one instrument, one objective" principle ("Tinbergen principle") but also disregards the strategic requirement of basing policy actions on forward-looking variables. Thus, in following the recommenda-

[13] See *Taylor, J. B.* (1993), Discretion versus policy rules in practice, Carnegie-Rochester Conference Series on Public Policy, 39, pp. 195.

tions of the Taylor rule the central bank does not pursue a forward-looking policy and systematically acts too late to prevent deviations from its targets.

There may be additional conceptual problems if the central bank were to follow the recommendations provided by the Taylor rule:

(i) The feedback effects of the inflation and output gap can offset one another, which may lead to questionable monetary policy recommendations. For example, an inflation gap of zero accompanied by a negative output gap would recommend an expansionary monetary policy. However, can the central bank be assured that an increase in the money supply will affect growth or merely inflate prices?

(ii) If the central bank is required to respond to output gaps, there may be circumstances in which its independence could be undermined. As an example, let us take a case in which the economy experiences declining growth (trend) because of misplaced wage, tax or fiscal policy. The central bank would then be required to "bail out" the government's policy, potentially cementing economically unfavourable developments, which, in turn, could conflict with the objective of price stability.

(iii) The calculation of the real short-term equilibrium rate (nominal short-term interest rate less the expected inflation rate) poses a number of difficulties. Most importantly, the calculation of real equilibrium rates depends strongly on the time period under review. In addition, the question of whether consumer prices or the GDP deflator should be used remains unresolved. However, these issues can heavily influence the level of the real short-term equilibrium rate.

(iv) It is questionable whether the real equilibrium interest rate can be assumed to remain constant over time. This economic variable depends on the expected 'marginal return on capital', the propensity to save and, most importantly, the credibility and reliability of the central bank's money market management. Although changes in any of these variables will have profound consequences for the real short-term equilibrium rate, they are not accounted for in the Taylor rule.

The aspects above highlight the conceptual problems of pursuing a monetary policy based on the Taylor rule. Whether the Taylor-rule should ultimately be accepted or dismissed, however, depends on the result of a comparison with the best alternative strategy. Below, we compare the Taylor rule with MT.

Re (2): Taylor Rule versus Monetary Targeting

According to MT, the central bank changes the interest rate (Di) according to deviations of the actual monetary growth rate (Dm) from the target monetary growth rate (Dm^*):

(2a) $Di = l \cdot (Dm - Dm^*)$, and $l > 0$.

If, for instance, the actual money supply exceeds the target rate, that is $\Delta m > \Delta m^*$, the central bank is required to raise interest rates. To qualify as a policy strategy, MT has to meet three well-known requirements. Firstly, the demand function for the monetary aggregate under review must be stable. This implies a stable relationship between the stock of money, output, interest and prices over time. Secondly, the central bank must be able to control the monetary aggregate through its operating target, that is to say the interest rate. The monetary aggregate

should preferably respond negatively (positively) to increases (reductions) in central bank rates. Thirdly, changes in the monetary aggregate must precede changes in the final policy objective.

In recent years, money demand functions in a number of countries have become unstable due to factors that include innovations in financial markets ("securitisation" and "disintermediation"). Having said that, a central bank relying on a monetary aggregate as the sole information variable for its policy would run the risk of pursuing an incorrect monetary policy if a hitherto stable money demand function were to become unstable. This, in fact, may be an important reason why central banks such as the ECB, which has assigned a prominent role to money, interprets the money supply by taking account of a wider set of policy indicators. Nonetheless, it should be noted that there are numerous studies providing evidence of a stable demand function for M3 in the Euro zone.[14]

The main contrasts between the Taylor rule and MT are that MT pursues a forward-looking, i.e. pre-emptive, policy and focuses on trends rather than being cyclical. Under MT, the central bank does not act in response to deviations of actual inflation and growth as such but to (persistent) deviations of the actual growth in the money supply from the target growth. The target money supply (m^t) is calculated on the basis of the equation of exchange:

$$m^t = y^* + p^* - v^*,$$

where y^* = potential output, p^* = target price level and v^* = velocity of money.[15] Another interesting feature of MT is that there is no 'real short-term equilibrium interest rate'. Thus, under an MT regime the central bank is not required to restore or pursue an equilibrium rate. It merely changes official rates to keep the money supply on the expected target path. As a result, MT is not about defending a certain interest rate level but about stabilizing the growth of the money supply by following a trend-based rather than a cyclical interventionist approach.

2. How the ECB and the US Fed have reacted – some empirical findings

This section attempts to shed some light on the reaction functions of the US Fed and the ECB. For the US, we examine the periods January 1980 to December 2001 and August 1987 to December 2001 (more or less the "Greenspan years"[16]). For the Euro zone, we focus on the period from January 1999 to the end of 2001. In order to identify the variables responsible for the setting of central bank interest rates, our first step was to calculate pairs of coefficients for the correlation between official central bank rates and various monetary and real economic variables. The second step was to provide a "preliminary" interpretation of the policies observed and, in the case of the Fed, to estimate a central bank reaction function.

[14] See, for example, the analyses prepared by ESCB staff.

[15] For further analysis on the differences between a monetary policy based on the Taylor rule and MT see Leschke, M., Polleit, T. (2000), Die Taylor-Regel: Ein Konzept für das Europäische System der Zentralbanken?, in: Bankarchiv, 48. Jhrg., Mai, 355-359.

[16] Alan Greenspan became Chairman of the Federal Reserve Board on 11 August 1987.

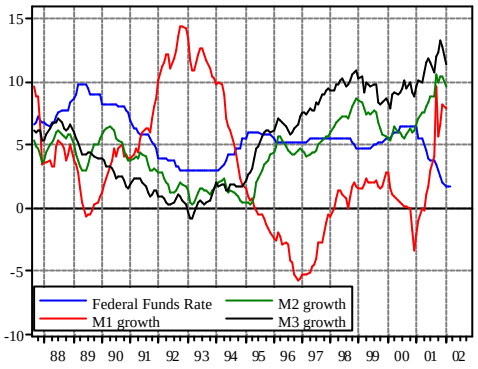
Re (1): US Fed monetary policy 1987 to 2001

Fig. 4 shows the Federal Funds Target Rate (FFTR) and selected real economic and monetary variables. Fig. 5 shows the correlation coefficients between the FFTR and various monetary and real economic variables for the period January 1980 to December 2001 (above the diagonal) and August 1987 to December 2001 (below the diagonal). In the latter period, the following pairs of correlation coefficients could be observed:

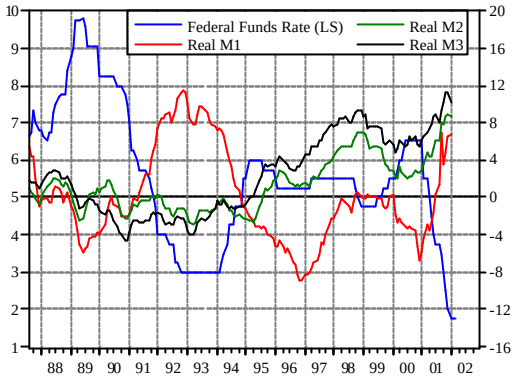
- The relationship between M2 and M3 growth on the one hand and the FFTR on the other hand was rather weak. The correlation coefficient between the growth of M1 and the FFTR, however, was relatively pronounced (coefficient –0.44).
- The correlation coefficients between annual real GDP growth, industrial production and the FFTR were rather low (–0.06 and 0.00, respectively).
- The relation between current changes in the consumer price index (headline and underlying rate) and the FFTR were pronounced: the correlation coefficients amounted to 0.69 and 0.53 respectively.
- A negative correlation between the unemployment rate and the FFTR could be detected (coefficient –0.34).
- The DEM/USD reveals no link to the FFTR (correlation coefficient 0.09), whereas for JPY/USD it amounted to 0.47.
- Most interestingly, the correlation coefficient between annual changes in stock market valuation and the FFTR was virtually zero.

Fig. 4: US Federal Funds Target Rates and monetary and real economic variables

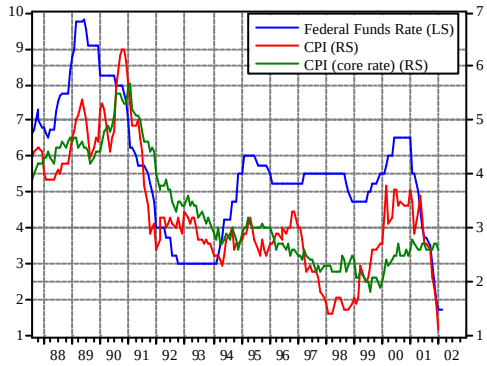
(a) Federal Funds Target Rate and money supply growth



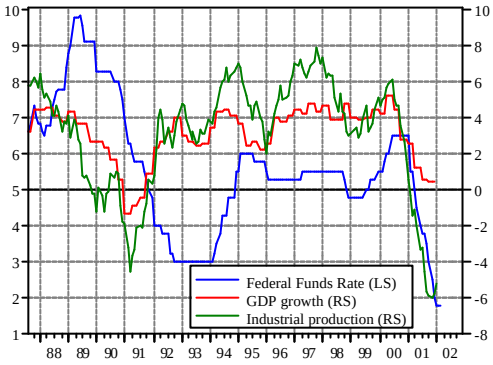
(b) Federal Funds Target Rate and real money supply growth



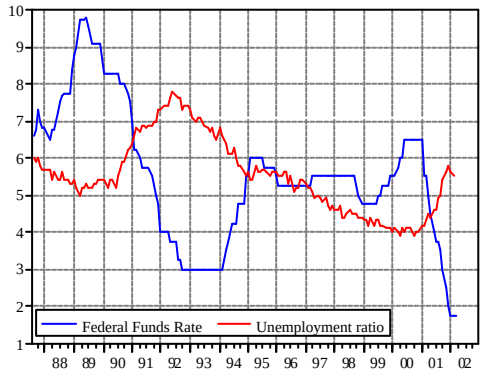
(c) Federal Funds Target Rate and inflation



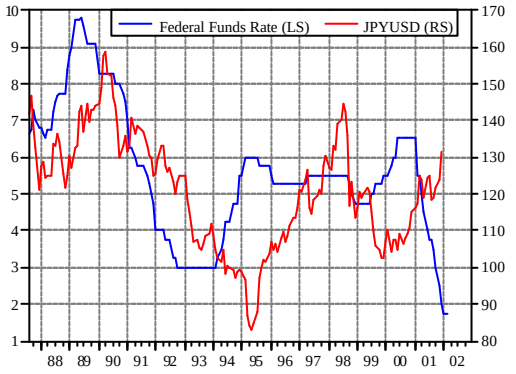
(d) Federal Funds Target Rate annual GDP growth and industrial production



(e) Federal Funds Target Rate and unemployment rate



(f) Federal Funds Target Rate and JPY/USD



Data source: Primark Datastream; own calculations.

Fig: 5: Cross correlation coefficients (below diagonal: August 1987 to December 2001; above diagonal: January 1980 to December 2001)

	Federal Funds Target Rate	M1	M2	M3	CPI	CPI (underlying)	GDP	Industrial production	Unemployment rate	DEM/USD	JPY/USD	Stocks
Federal Funds Target Rate		0.05	0.48	0.48	0.81	0.85	-0.20	-0.16	0.40	0.44	0.73	-0.15
M1	-0.44		0.21	-0.12	0.07	0.22	-0.07	-0.15	0.63	0.29	0.39	-0.02
M2	0.15	-0.38		0.85	0.23	0.32	-0.05	-0.26	0.35	0.71	0.72	0.11
M3	0.07	-0.59	0.87		0.22	0.26	0.05	-0.09	0.06	0.64	0.54	0.02
CPI	0.69	0.08	-0.17	-0.40		0.96	-0.42	-0.32	0.32	0.12	0.53	-0.26
CPI (core)	0.53	0.34	-0.25	-0.57	0.86		-0.45	-0.37	0.49	0.22	0.65	-0.25
GDP	0.06	-0.27	0.00	0.28	-0.37	-0.50		0.88	-0.31	0.17	-0.13	0.25
Industrial production	0.00	-0.25	-0.35	0.01	-0.33	-0.42	0.84		-0.29	-0.04	-0.22	0.25
Unemployment rate	-0.34	0.73	-0.69	-0.85	0.22	0.52	-0.42	-0.18		0.45	0.74	-0.03
DEM/USD	0.09	-0.12	0.63	0.62	-0.04	-0.24	0.02	-0.29	-0.56		0.79	-0.10
JPY/USD	0.47	0.12	0.34	-0.02	0.47	0.59	-0.26	-0.40	0.09	0.19		-0.06
Stocks	0.00	-0.31	0.00	0.10	-0.37	-0.34	0.29	0.40	-0.16	-0.23	-0.03	

Data source: Primark Datastream; own calculations.

n order to explore its behaviour in setting interest rates in more detail, we assumed that the Fed might have followed a multi-variable approach. We regressed quarterly changes in the FFTR to (i) quarterly changes in the unemployment rate (DUER), (ii) quarterly changes in the annual change of the consumer price index in log form (DDLNCPI) and (iii) lagged quarterly changes in the FFTR (DFFTR) to take into account omitted variables, which can be expected to influence the FFTR.

The estimated results for the period 1987:Q1 to 2001:Q4 are shown in Fig. 6. All variables are statistically significant, and the estimate explains around 68% of the variance in the change in the FFTR. According to the findings above, the Fed's final policy objectives – inflation and employment – appear to have played an important role in their setting of rates. On the basis of these findings, Fig. 7 shows the level of the actual and estimated FFTR for the period 1987:Q1 to 2001:Q4.

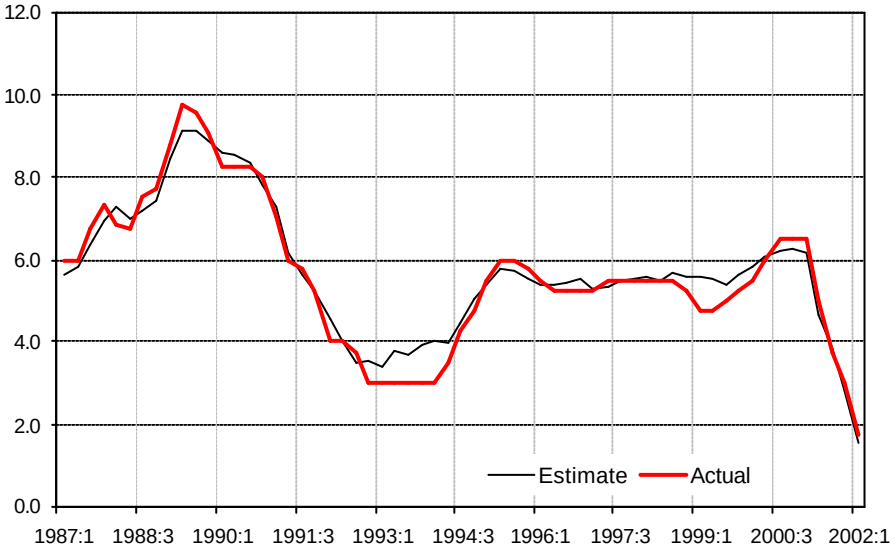
Fig. 6: Estimation results for the Federal Funds Target Rate

Dependent Variable: D(FFTR), sample: 1987:1 2001:4, observations included: 60.
Method: Least Squares, White Heteroskedasticity-Consistent Standard Errors & Covariance.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000622	0.000421	-1.476334	0.1457
DUM891	0.008372	0.000473	17.70984	0.0000
DUM012	-0.010687	0.000772	-13.84594	0.0000
DDLNCPI(-1)	0.165096	0.068371	2.414727	0.0192
DUER(-1)	-0.010210	0.001824	-5.597073	0.0000
D(FFTR(-1))	0.347828	0.088931	3.911194	0.0003

R-squared	0.677343	Mean dependent var	-0.000479
Adjusted R-squared	0.647467	S.D. dependent var	0.005311
S.E. of regression	0.003154	Akaike info criterion	-8.585954
Sum squared resid	0.000537	Schwarz criterion	-8.376519
Log likelihood	263.5786	F-statistic	22.67205
LM (4) F-statistic	1.779603	Prob(F-statistic)	0.000000

Fig. 7: Federal Funds Target Rate – actual and estimated (1987:Q1 to 2001:Q4)



Data source: Datastream Primark; Bloomberg; own calculations.

This estimate implies that a rise of 1 % in the inflation rate leads to a 0.31 % rise in the Federal Funds Target Rate, whereas a 1 % increase in the unemployment rate results in a 1.5 % reduction in the Federal Funds Target Rate. This suggests that the Fed reacts very sensitively to changes in the unemployment rate.

Re (2): ECB monetary policy January 1999 to December 2001

To shed some light on the ECB's interest setting policy, we took a closer look at the relationship between the ECB main refinancing rate (refi rate) and monetary and real economic variables for the period January 1999 to December 2001. The following pairs of correlation coefficients could be observed (see Fig. 8):

- On average, the ECB raised (lowered) interest rates when M3 growth converged with (deviated from) the reference value (correlation coefficient –0.33).
- Looking at real M3 growth (nominal M3 growth less current inflation), periods in which real M3 growth increased (decreased) were, on average, accompanied by a reduction (increase) in interest rates (correlation coefficient –0.76).
- A similar counterintuitive relationship between the level of bank loan growth and ECB rates could be observed (correlation coefficient: –0.39): periods of higher (lower) bank loan growth were, on average, accompanied by lower (higher) ECB rates.
- A very close relationship was observed between ECB rates and changes in the HICP (correlation coefficient 0.86). An annual increase in the HICP in excess of (below) the ECB's 2.0 percent ceiling was accompanied by higher (lower) ECB rates.
- The relationship between ECB rates and real GDP growth has been rather weak (correlation coefficient –0.17).
- The declining EUR/USD was, on average, accompanied by higher ECB rates (correlation coefficient –0.76).
- The unemployment rate and the ECB refi rate revealed a relatively strong negative relationship (correlation coefficient –0.83).

Fig. 8: Cross-correlations (January 1999 to December 2001)

	ECB refi rate	M3 growth	Real M3 growth	Loan growth	HICP growth	GDP growth	EUR/USD	Unemployment rate	US Federal Funds Target rate
ECB refi rate	1.00								
M3 growth	-0.33	1.00							
Real M3 growth	-0.76	0.81	1.00						
Loan growth	-0.39	-0.56	-0.12	1.00					
HICP growth	0.86	-0.09	-0.65	-0.53	1.00				
GDP growth	-0.17	-0.45	-0.28	0.75	-0.07	1.00			
EUR/USD	-0.76	-0.08	0.49	0.59	-0.93	0.13	1.00		
Unemployment rate	-0.83	-0.10	0.47	0.67	-0.93	0.23	0.94	1.00	
US Federal Funds Target rate	0.19	-0.78	-0.61	0.77	0.03	0.88	0.15	0.14	1.00

Data source: Bloomberg, ECB; own calculations. – M3, bank loans, HICP (Harmonised Index of Consumer Prices) and GDP expressed as annual growth rates. – Real M3 growth = annual M3 growth (seasonally adjusted) minus current annual increase in HICP.

The pair wise correlation analysis suggests that the ECB has responded strongly to current inflation in the period under review. We interpret this policy reaction as be-

ing driven by the ECB's deliberate efforts to build up a reputation as an "inflation fighter" from the very beginning of Stage Three of EMU: by raising rates in response to rising inflation, the ECB was signalling to the markets and the public at large its determination to keep inflation in line with its price stability promise. The ECB appears to have preferred to respond to "cost-push" effects such as oil price rises and exchange rate induced increases in import prices rather than relying on forward-looking indicators.

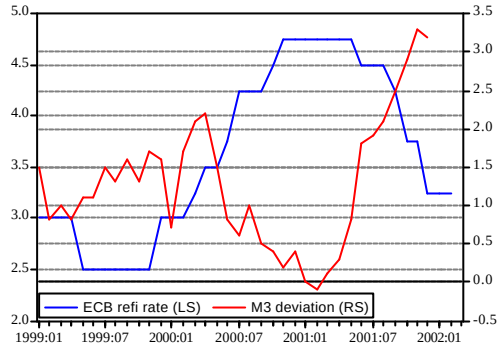
Our results show that, in the admittedly short reference period, the ECB has reacted counter intuitively to the signals provided by reference value concept. In view of the negative relationship between real M3 growth and ECB rates, it is fair to say that the bank has actually conducted a pro-cyclical monetary policy: an increase (reduction) in the real money supply – an argument for a further impetus to (drag on) the business cycle – has actually been accompanied by a monetary policy stimulus (drag). It should be noted, however, that these results are based on "headline" M3 growth figures which are not adjusted for (temporary) distortions of M3 that were felt from the middle of 2001. However, even after allowing for an – admittedly discretionary – correction in the stock of M3 for the period from July 2001 onwards, it still seems that the ECB has not reacted in the way suggested by its first strategy pillar (the ECB cut rates by 25bp on 30 August 2001).

Looking at ECB rates and the EUR/USD exchange rate, we are inclined to interpret the relatively close and negative relationship between these two variables as "spurious". The pronounced co-movement appears to be largely due to the ECB's response to current inflation rather than an monetary policy focused on the exchange rate: in the period under review, the increase in the annual changes in the HICP – largely driven by "cost-push"-factors – has been accompanied by a more or less continuously devaluing Euro exchange rate vis-à-vis the US-dollar.

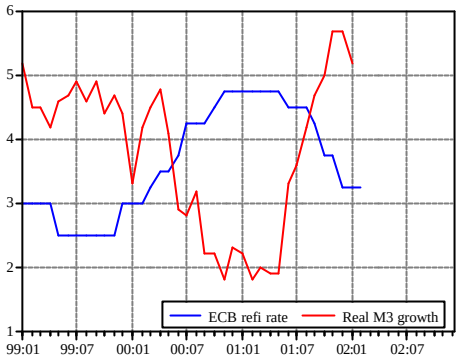
Moreover, neither real GDP growth nor changes in the labour market appear to have exerted a systematic impact on the ECB's rate setting policy. The positive, albeit relatively small, co-movement of ECB rates and the US Federal Funds Target Rate may be largely attributable to the relatively pronounced synchronicity of the US and Euro zone business cycles in the period under review. Moreover, the events of 11 September 2001 and the resulting central bank reactions have certainly increased the co-movement between US Fed and ECB interest rates. Finally, we attribute the finding that the ECB lagged the US Fed in adjusting rates to the differences in the states of the US and Euro zone business cycle and to the differences in the central banks' policy objectives.

Fig. 9: ECB refi rate and monetary and real economic variables

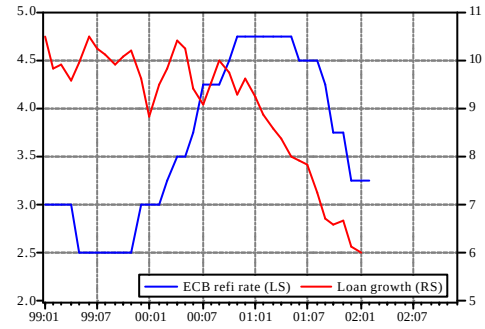
(a) ECB refi rate and deviation of M3 from the reference value



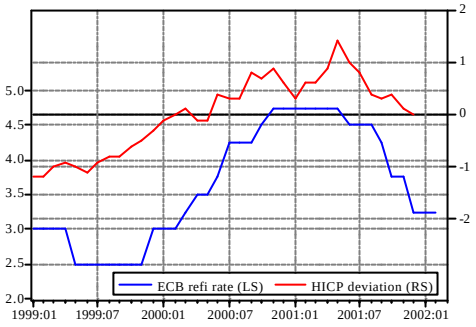
(b) ECB refi rate and real M3 growth



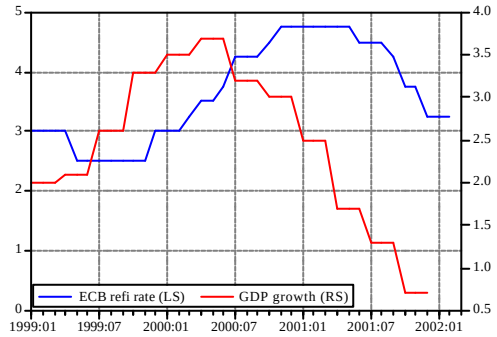
(c) ECB refi rate and annual loan growth



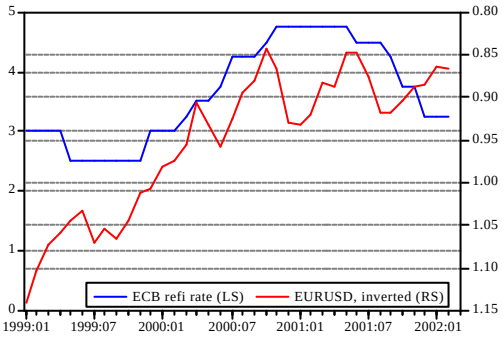
(d) ECB refi rate and deviation of HICP from the 2 percent ceiling



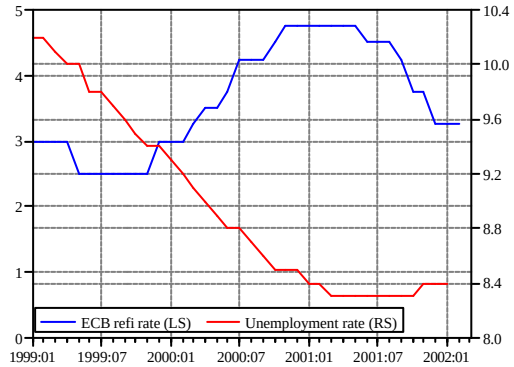
(e) ECB refi rate and annual GDP growth



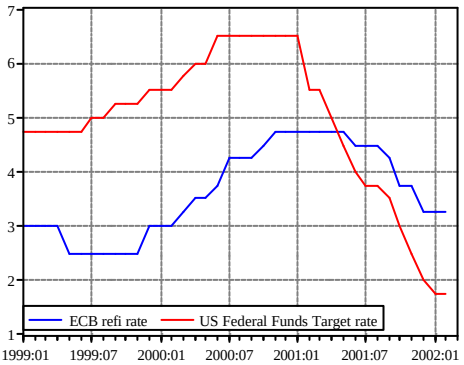
(f) ECB refi rate and EUR/USD (inverted)



(g) ECB refi rate and unemployment rate



(h) ECB refi rate and US Federal Funds Target rate



Data source: ECB; Bloomberg; Datastream Primark; own calculations.

3. Conclusions and outlook

When looking at monetary policies in the periods under review (that is January 1987 to December 2001 for the US and January 1999 to December 2001 for the Euro zone), actual changes in final policy objectives – inflation, employment and growth for the US Fed and inflation in the case of the ECB – seem to have strongly influenced the interest rate decisions of both central banks. Both central banks appear to have predominately reacted to actual deviations in objective variables from their target values rather than to signals provided by forward-looking indicators: monetary policy seems to have been primarily influenced by short rather than long-term developments. What is the rationale behind such behaviour?

In the period from 1987 to the end of 1993, the Fed's policy focus succeeded in bringing inflation to acceptable levels. Following the disinflation period, the US central bank has adopted a rather more pragmatic monetary policy. Especially from the middle of the 1990s onwards, the US Fed seems to have become increasingly concerned with uncertainties related to structural changes within the US economy, which would carry the risk of rendering hitherto stable relationships between monetary policy and inflation and output unreliable. The assumed implications of the "New Economy" paradigm appear to have led the US Fed to favour a kind of "wait and see" monetary policy over a policy approach relying on historically observed relationships.

The US Fed may feel little incentive to adopt a more formal framework to guide its policy decisions. Firstly, the general strength of the US economy shields the US Fed from undue political pressure. Secondly, the Fed's policy seems to be well understood as far as financial market price actions are concerned, even though the Fed has never put forward a formal definition of its policy concept: its widely accepted reputation as pursuing a "hybrid objective function" – inflation and output stabilization – has not impaired its ability to stabilize the inflation expectations of economic agents. Thirdly, the Fed's decision-making bodies comprise highly regarded monetary policy exerts, who appear to be able to transfer their reputation and expertise to the Fed Board. The looming prospect of a "post Greenspan era", however, may put a different perspective on the rationale for having a defined strategy.

As far as ECB policy reaction is concerned, the need to build up reputation capital has certainly been a major factor driving the ECB Governing Council's interest rate decisions since January 1999. In fact, the ECB has preferred to react immediately to deviations from the 2.0 percent inflation ceiling rather than relying on the long-term signals provided by the monetary and credit aggregates. From the bank's viewpoint, this was very rational: by following this course, the ECB has been able to give a clear-cut signal to the financial markets and the public at large, thereby strengthening its "inflation fighting" image. Looking forward, however, a growing stock of reputation capital may allow the ECB to increasingly bring its monetary policy decisions into line with its defined monetary policy strategy. That said, the ECB's reaction function might be subject to change in the years to come.

Part 3: The influence of monetary policy on consumer prices

CONTENT: *1. Recent developments. – 2. The discussion about optimum inflation. – 3. Inflation in the US and the Euro zone – empirical evidence.*

1. Recent developments

In recent years, inflation rates – measured as the annual increase in consumer prices – in industrial countries have fallen to levels not seen since the late 1950s. Following the inflation binges of the 1970s, inflation has moderated in the 1980s and 1990s and has declined further up to the beginning of the new millennium. In the US, inflation now seems to be consistent with what the US central bank might consider price stability. In the Euro zone, inflation has also declined to levels, which were thought to be unattainable even a few years ago. Since its inauguration, the ECB has, on average, kept actual inflation relatively close to its expected 2.0 percent ceiling. In Japan, however, the economy has remained more or less in deflation throughout the 1990s as evidenced by the developments in the real and monetary sector of the economy.

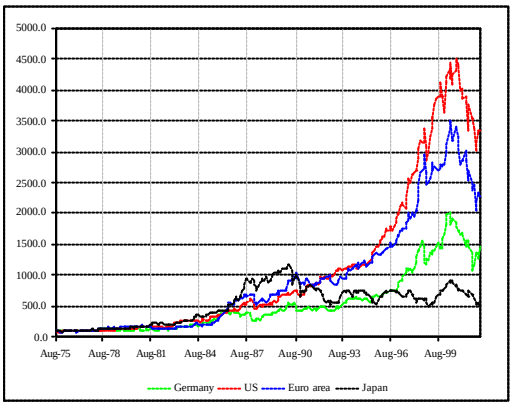
Inflation in industrial countries has not only declined in absolute terms but has also become less volatile. This finding may be of relatively little surprise in view of empirical work, which has shown that average levels of inflation have had a positive relationship with volatility, both within countries and between countries (see, for example, Friedman (1977) and Taylor (1981)). Moreover, inflation has become more predictable: as inflation volatility has fallen, it has – unsurprisingly – become easier for economic agents to form an opinion about the future path of inflation. Finally, inflation has become less persistent. For example, increases in current inflation have tended to become rather short-lived. Once inflation has increased, the time it takes for inflation to decline to the previous level has declined. In general, inflation expectations seem to have become more aligned to the central banks' stability promises.

The decline in inflation has created a more stable economic environment, having contributed to a reduction in output volatility. This finding may be due to a number of factors. For instance, low and stable inflation should have removed inefficiencies associated with increases in the price level. Low and stable inflation should have helped the market mechanism to fulfil its allocation function more efficiently. Distortions of relative price changes, which usually accompany high and volatile inflation, have been reduced. Moreover, increasing confidence in stabilized monetary conditions can be expected to have reduced economic agents' transaction costs, thereby improving overall factor productivity. Of course, output and employment are determined by numerous factors. Inflation is simply one – albeit prominent – explanatory variable. It may be that the combination of a marked decline in inflation and lacklustre growth in output performance in various European countries has brought the discussion about "optimum inflation" to the forefront.

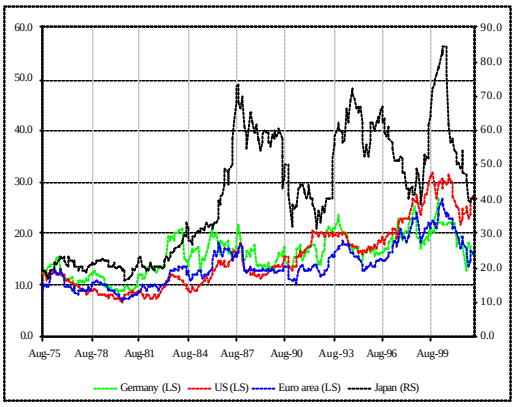
Box 2: Stock prices in recent years

While inflation in most industrial countries have either declined or remained within an acceptable range, both bond and equity markets in the US and the Euro zone have recorded substantial gains. For example, in the period January 1990 to June 2002, overall European stock market performance amounted to around 235.0 percent, whereas the total return in the US stock market amounted to 325.0 percent (see chart 1; in nominal terms). At the same time, traditional and widely observed valuation measures such as, for example, the price-earnings ratio (PE ratio), rose sharply, well exceeding their historical values (see chart 2), suggesting "high valuations" of stocks. Even after the decline of stock market valuations, which started in the US around the middle of 2000 and in the Euro zone around the end of 2000, current stock market valuations appear to have remained at relatively high levels by historical standards. In view of low and stable inflation accompanied by rising stock prices, concerns have emerged that monetary policy may have financed a kind of "stock price inflation".

(1) Overall stock market performance



(2) Price earning ratios



Data source: Datastream Primark; own calculations.

Given the considerable uncertainties surrounding stock market pricing (the lack of information about investors' expected equilibrium returns, the degree of investor risk aversion etc.), however, there is still a lack of equivocal – theoretical and empirical – evidence to provide a definitive answer for the extent to which monetary policy can be held responsible for the marked increases in stock price valuations witnessed in recent years. For instance, a look at the income velocities of money and the "income–plus–stock" velocities of money in the US and the Euro zone since the beginning of the 1980s does not provide equivocal evidence as to whether monetary policy might have pursued an overly expansionary course that contributed to inflating stock prices. In the next ECB OBSERVER report we will devote extensive efforts to dealing with these issues in more detail.

2. The discussion about "optimum inflation"

There is a growing belief among some economists that the ECB pursues too restrictive a monetary policy by keeping inflation below 2% per annum. According to this school of thought, allowing for upper-end inflation of 3% would be more appropriate – the policy pursued in Canada and Sweden and assumed in the US. This discussion centres on the search for "optimum inflation". Although economists devote a great deal of attention to the analysis of the short and long-term effects that inflation has on growth and employment, a consensus view of the optimum inflation level is yet to emerge.

An increase in the central bank's credible and established inflation target, and thus in actual inflation, is likely to have distributive consequences: recipients of fixed nominal cash flows would suffer real losses, while debtors would earn windfall prof-

its. If economic agents doubt the durability of the new inflation promise, risk premiums could be expected to increase and drive interest rates up, thereby exerting a detrimental effect on growth and employment. If the transition to higher inflation represents "surprise inflation", it may provide a benefit in the form of a one-off boost to the business cycle.

What about the costs and benefits once inflation has been increased? One view is that a move to a higher inflation rate would provide a net benefit by "lubricating" the economy, resulting in higher growth and employment. However, at the opposite end of the spectrum is the belief that any rise in inflation is damaging, essentially "throwing a spanner in the works of the economy"; here, the negative impact on growth and employment outweighs the benefits. It is clear, then, that economics provides a broad foundation on which to recommend an optimum level of inflation, ranging from slightly higher inflation to zero inflation, or even slight deflation. Empirical studies clearly show that high inflation is negative in terms of economic and social welfare. With low inflation, however, the results are far more ambiguous. One plausible interpretation is that growth and employment move independently of low inflation, i.e. low inflation does not cause losses in output. In view of theoretical considerations and acquired experience, there is no convincing evidence to suggest that the ECB's 2.0% maximum inflation would be incompatible with promoting economic and social welfare.

Most recently, demands for an increase in the ECB's expected inflation have been made in light of the anticipated impact on inflation of the Euro zone's Eastward expansion. It has been argued that countries acceding to the EU will experience higher ("catch-up") productivity growth in the tradable goods sector and thus higher inflation than countries already in the Euro zone ("Balassa-Samuelson" effect). As a result, if the ECB is to deliver on its inflation promises, high inflation in the eastern countries will have to be compensated for by low inflation in those countries currently in the Euro zone. According to this theory, to prevent deflationary forces in the Euro zone, the ECB should allow for higher maximum inflation than 2.0%. It should be noted, however, that studies on the Balassa-Samuelson effect tend to neglect the role that money plays in inflation and thus run the risk of drawing economically inadequate conclusions. Moreover, the eastern countries will be subject to convergence in the run-up to joining the Euro zone, which should bring those countries' inflation into line with the ECB's expected inflation. Finally, the economic weight of the expansion countries relative to the rest of the Euro zone is small: if ten countries join in the second half of the decade, Euro zone GDP will rise by only 11.0%. As a result, any impact that these countries will exert on Euro zone inflation is likely be correspondingly small.

There may also be an additional rationale for why the ECB may, and should, refrain from changing its well-established inflation promise. Overcoming nominal wage rigidities by way of higher inflation would actually reduce wage groups' incentives to take economic responsibility for the adequacy of wage agreements: the costs of excessive wages would not have to be borne by the wage negotiation partners but would be socialised by a loss of the Euro's purchasing power; monetary policy would actually be contributing to cementing rather than solving structural problems, which would hardly be in the interest of the European populace.

Box 3: The "zero interest rate floor" – a problem for monetary policy?

There is a discussion about the determination of optimum inflation that centres on the risks associated with having too low a level of inflation. With monetary policy having succeeded in attaining low and stable consumer price inflation, concerns about inflation have been counterbalanced by concerns about deflation, especially in view of the nominal "zero interest rate floor" (ZIF). Some economists have argued that "the danger of getting into a deflationary spiral increases markedly as inflation targets are lowered below 2 percent." (see IWF, 2002, p. 32). Moreover, concerns about the potential for deflation suggest that "central banks need to be more proactive in responding to sharp unfavourable shocks to economic activity." (see ibid.)

Deflation, which can be defined as an ongoing decline in the economy's price level, is believed to blunt the effectiveness of monetary policy. The proponents of this line of thinking argue that if the annual increase in the price level becomes negative, a lowering of the nominal short-term interest rate to zero, the lowest level of nominal rates attainable, may no longer be sufficient to boost the economy, as real short-term interest rates might be prevented from falling to the required level. Given too high a real interest rate, output would fall further, lowering the price level, thereby increasing the real rate still further. The economy would enter a deflationary spiral.

In view of this potential danger, an annual increase of 2 percent in the economy's price level is considered a minimum, which should not be undershot on a prolonged basis. Do these findings suggest that, for instance, the ECB is already pursuing too low an expected inflation rate in the Euro zone? To form a balanced view on this issue it is of the utmost importance to highlight the very assumptions, which underlie the models that have recently dealt with the potential risks resulting from ZIF and, in addition, it may well provide an insight to contrast them with the results of alternative models.

To begin with, models that suggest that negative inflation could trigger a deflationary trend rest on certain assumptions about the workings of the economy. More specifically, the models suggest that monetary policy works solely via the (real) short-term interest rate on the real and monetary sector of the economy (this notion is closely related to a Keynesian interpretation of the economy). Once the nominal short-term rate has hit zero, monetary policy could lose its impact on the economy if the negative annual change in the price level is higher than the economy's marginal efficiency of capital. In such an environment, the real short-term rate can no longer be reduced by monetary policy to restore the economy's equilibrium. Monetary policy must therefore make sure that inflation runs at a level that allows positive inflation to prevail even in periods when the economy is in recession, thus securing monetary policy effectiveness.

These conclusions would have to be revised if a model were used in which market processes allow the economy to restore itself to equilibrium, e.g. where the economy is believed to exhibit an inherent tendency to run at its potential if it is not disturbed by discretionary monetary and/or fiscal policy measures. If the price level were to fall, it could be argued that the real money supply increases, raising economic agents' real money holdings above their long-term desired balances. In an attempt to restore the previous equilibrium, economic agents could be expected to increase their demand for goods and services, thereby restoring output, employment and finally, the price level, to equilibrium (this interpretation of the workings of the economy is actually closely aligned to Monetarist thinking). In such a model world, the decline in the price level would only be a temporary phenomenon. In fact, once the central bank assures that the money supply remains sufficient to allow the financing of potential output (and making allowance for the change in the velocity of money and an accepted increase in the price level), deflation can actually be prevented.

At this juncture it should be noted that there are theoretical considerations, which suggest that the central bank may not necessarily lose its effectiveness even though nominal rates have hit zero. For example, the central bank can start buying bonds in the open market. As a result, the money supply in the hands of private agents increases, which increases their real money holdings and may thus stimulate the economy. Moreover, the central bank could engage in other forms of liquidity providing operations (swaps, FX market transactions, buying of non-financial assets, etc.) and policies to induce inflation expectations – and thus current inflation – to prevent it from falling further, i.e. start to in-

crease.

To summarize, assumptions about the theoretical model of the economy – which may vary considerably (sic!) – are crucial when it comes to drawing conclusions about the effectiveness of monetary policy in an environment of falling prices; the conclusions are by no means independent of the theoretical economic model used. That said, outright calls for an increase in the ECB's upper 2.0 percent inflation range because of potential risks associated with ZIF should be taken with a certain dose of scepticism. In general, it seems reasonable to determine optimum inflation by weighing up the costs and benefits associated with various levels of inflation. Potential costs associated with relatively low target inflation alone might not suffice to justify an increase in the ECB's upper 2.0 percent inflation range.

Recently, much attention has been given to IWF (2002), World Economic Outlook, Monetary Policy in a Low Inflation Era, pp. 25. In this context see also *Summers, L. H.* (1991), How Should Long-Term Monetary Policy Be Determined?, in: Journal of Money, Credit and Banking, Vol. 23, No. 3, pp. 625-31; *Johnston, K., Small, D., Tyron, R.* (1999), Monetary Policy and Price Stability, 27. Volkswirtschaftliche Tagung der Oesterreichischen Nationalbank, Vienna, pp. 15; *Fischer, S.* (1996), Why Are Central Banks Pursuing Long-Run Price Stability?, in: Achieving Price Stability, Federal Reserve Bank of Kansas City; *Phelps, E.* (1972), Inflation Policy and Unemployment Theory, London, MacMillan Press Ltd.

3. Explaining inflation in the US and the Euro zone – empirical evidence

There has been an ongoing discussion in economic literature about the determinants of inflation. In this section we attempt to provide some empirical evidence of the inflationary processes in the US and the Euro zone. To this end, we present the results of empirical estimates of consumer price inflation. Furthermore, we highlight the relative importance of the various factors in determining inflation in each currency area.

Explaining inflation in the US

Fig. 11 shows the estimated results of the first differences in annual changes to the US consumer price index based on (i) quarterly changes in the price gap of the stock of M2 (DLN4PGM2, gliding four quarter averages), (ii) quarterly changes in the output gap (DLN4OG, gliding four quarter averages), (iii) quarterly changes in the unemployment rate (DUER), (iv) quarterly changes to the annual change in oil prices (DDLNOIL), (v) annual changes in the US dollar-ECU exchange rate (DLN4USDECU, gliding four quarter average) and (vi) lagged quarterly changes to the annual change in the consumer price index (DDLNCPI). All variables with the exception of DUER are expressed in logs. Figures in brackets show the number of lagged quarters. DUM represent dummy variables for the respective year/quarter. The variables are statistically significant at conventional measures. Fig. 12 shows the actual and estimated FFTR.

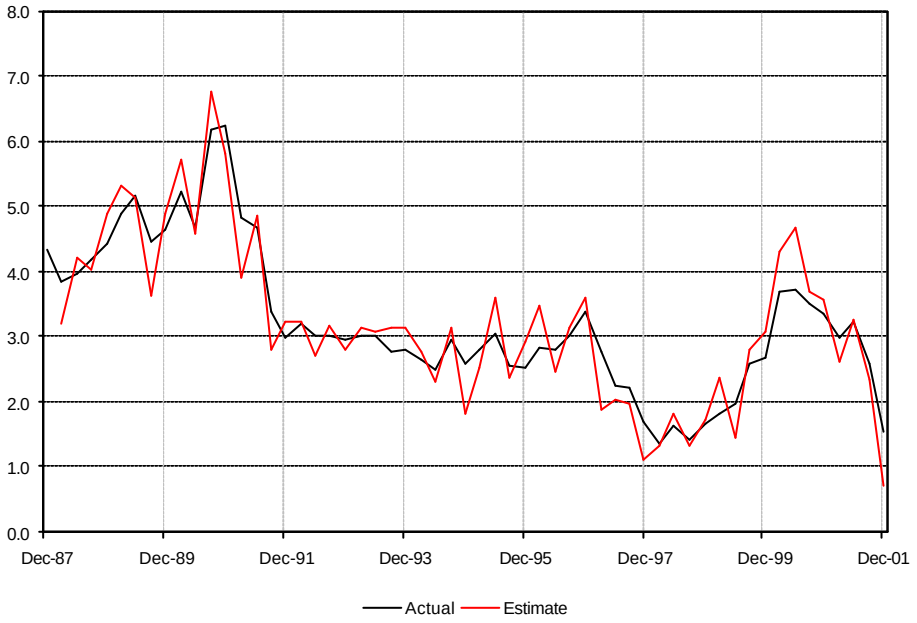
Fig. 11: Regression results for first differences in four quarter differences of the consumer price index (log)

Dependent variable: DDLNCPI, sample: 1987:1 2001:4, observations included: 60.
Method: Least Squares, White Heteroskedasticity-Consistent Standard Errors & Covariance.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000484	0.000602	0.804084	0.4251
DUM903	0.012135	0.001168	10.38771	0.0000
DLN4PGM2(-1)	0.199925	0.081691	2.447326	0.0179
DLN4OG	0.439394	0.158545	2.771410	0.0078
DUER(-2)	-0.006012	0.001705	-3.526041	0.0009
DDLNOIL	0.009429	0.002339	4.031520	0.0002
DLN4USDECU(-2)	0.041265	0.016799	2.456352	0.0175
DDLNCPI(-1)	-0.262857	0.107807	-2.438228	0.0183
DDLNCPI(-4)	-0.239295	0.098111	-2.439020	0.0182

R-squared	0.680709	Mean dependent var	5.91E-05
Adjusted R-squared	0.630624	S.D. dependent var	0.005270
S.E. of regression	0.003203	Akaike info criterion	-8.512112
Sum squared resid	0.000523	Schwarz criterion	-8.197960
Log likelihood	264.3633	F-statistic	13.59111
LM (4) F-statistic	0.565601	Prob(F-statistic)	0.000000

Fig. 12: US consumer price inflation – actual and estimated (1987:Q1 – 2001:Q4)



Data source: Datastream Primark; Bloomberg; own calculations.

Explaining inflation in the Euro zone

To estimate Euro zone consumer price inflation we took advantage of the "price gap" presented in ECB OBSERVER No 1, 17 April 2001. We regressed quarterly changes to the annual change in the Euro zone consumer price index (DDLNCPI) onto (i) quarterly changes to the annual change in the price gap of M3 (DDLN4PLM3, gliding four quarter average), (ii) quarterly changes to the annual change in the output gap (DDLN4OG, gliding four quarter average), (iii) quarterly changes to the annual

change in oil prices (DDLNOIL), (iv) quarterly changes to the annual change in the Euro-US dollar exchange rate (DDLN4EUROUSD, gliding four quarter average) and (v) lagged quarterly changes to the annual change in the price level (DDLNCPI). The results are shown in Fig. 13. All variables are expressed in logs. Figures in brackets show the number of lagged quarters. DUM represent dummy variables and the number in brackets show the respective year/quarter. All variables are statistically significant at conventional measures. Fig. 14 shows actual and estimated Euro zone inflation.

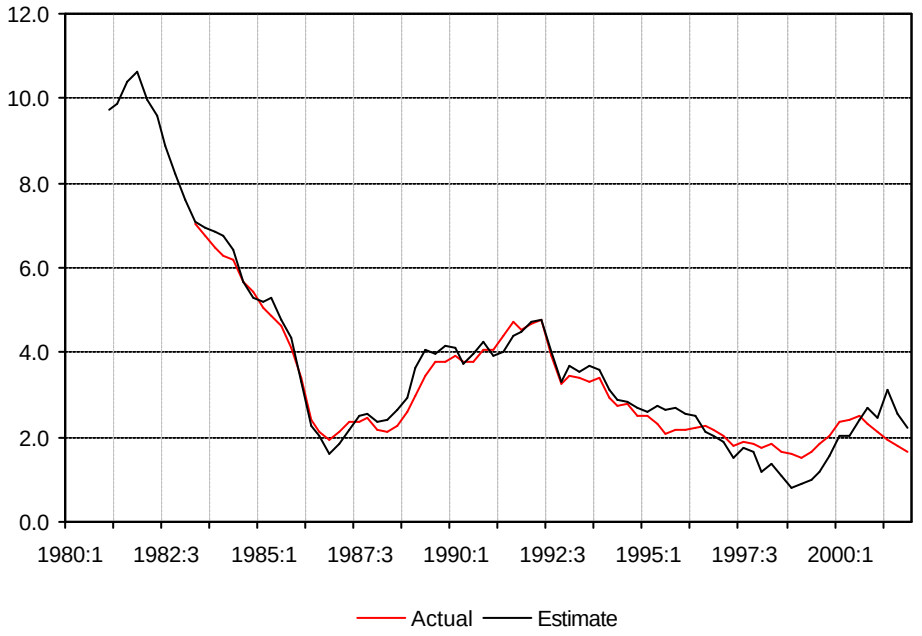
Fig. 13: Regression results for first differences of fourth differences of the log euro area deflator, 1982:Q2 to 2001:Q4

Dependent Variable: DDLNCPI, sample: 1982:2 2001:4, observations included : 79.
Method: Least Squares, White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001194	0.000379	-3.339277	0.0013
DUM801882	-0.002723	0.000584	-5.005689	0.0000
DUM9234	-0.005373	0.001536	-8.239035	0.0000
DLN4PLM3(-1)	0.452164	0.097121	4.869188	0.0000
DLN4OG(-1)	0.457488	0.115575	4.700322	0.0000
DDLNOIL	0.003175	0.001007	3.774715	0.0003
DDLN4EUROUSD(-1)	-0.021346	0.004055	-5.800711	0.0000
DDLNCPI(-2)	0.153009	0.075234	2.078252	0.0414
DDLNCPI(-4)	-0.237074	0.076267	-3.495126	0.0008

R-squared	0.693129	Mean dependent var	-0.000965
Adjusted R-squared	0.658058	S.D. dependent var	0.003383
S.E. of regression	0.001978	Akaike info criterion	-9.506599
Sum squared resid	0.000274	Schwarz criterion	-9.236662
Log likelihood	384.5107	F-statistic	19.76357
LM (4) F-statistic	1.634170	Prob(F-statistic)	0.000000

Fig. 14: Euro area inflation – actual and estimated (1982:Q2 to 2001:Q4)



Data source: ECB; Primark Datastream; own calculations.

Based on the empirical findings, it is fair to say that the inflation rate in the Euro zone is mainly driven by the price gap (see last ECB OBSERVER report, 19 November 2001), whereas the US inflation rate is largely driven by the output gap. Having said that, the US price gap does not help to explain the variance of US inflation. Against the backdrop of these findings it is reasonable to conclude that money does not play a prominent role in the monetary policy of the Fed.

Part 4: ECB interest rate policy and inflation perspectives

CONTENT: *1. ECB policy in the last 6 months. – 2. Shadows on the long-term stability outlook: a blow to the European Stability and Growth Pact. – 3. Looking ahead: inflation and ECB rates.*

1. ECB policy in the last 6 months

Since our last ECB OBSERVER report dated 19 November 2001, the ECB has kept its main refinancing interest rate unchanged at 3.25%. This current rate was largely a result of the exceptional circumstances related to 11th September 2001. The continuing decline in overall economic activity in the Euro zone in the remainder of last year, accompanied by increasing uncertainty about the future path of the US economy, did not induce the ECB Governing Council to ease monetary policy any further. In contrast, the US Fed lowered rates to 1.75% – a 40-year low – on 11 December 2001. In addition to the relatively positive view about the medium to long-term perspectives for Euro zone growth held by the ECB Governing Council, the annual increase in the HICP in excess of the ECB's 2.0 percent ceiling seemed to provide a rationale for why the ECB has refrained from cutting rates below the 3.25% level.

The growth of the money supply remained buoyant in the second half of last year. Annual expansion in the stock of M3 rose from 5.5% in June to an all-time high of 8.0% in December, well above the ECB's 4.5% reference value. In February 2002, annual M3 growth had declined to 7.8% and stood at 7.5% in May. There are a number of arguments as to why M3 growth has not yet posed a danger to future price stability. Firstly, the marked volatility in stock markets may have induced investors to keep an extraordinarily high portion of their funds in short-dated deposits included those covered by M3. Secondly, the uncertainties related to 11th September may also have induced investors to exhibit a relatively high preference for highly liquid (bank) assets. These two developments could account for the marked growth of M3.

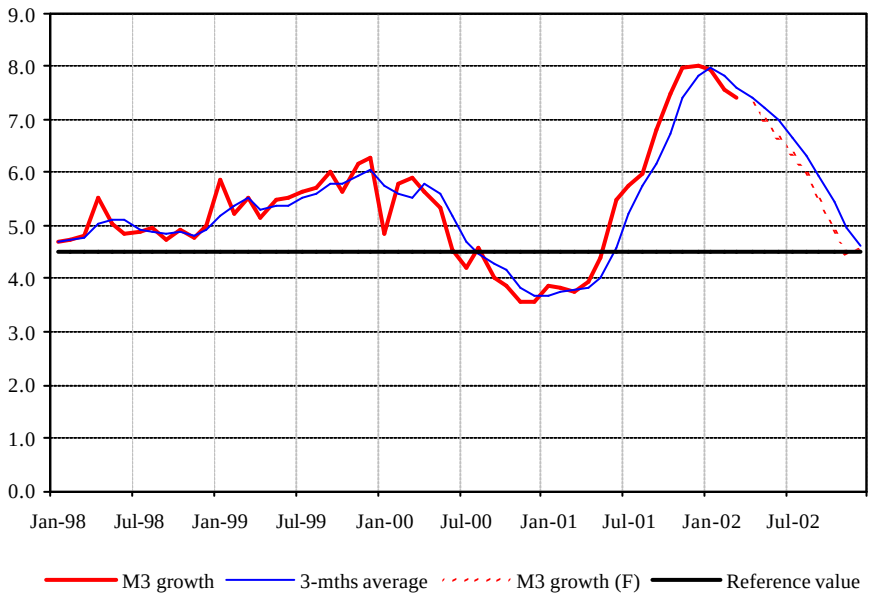
Particularly when analysed against the backdrop of bank credit expansion in the Euro zone – the source of money production – it seems plausible to hold portfolio effects rather than excessive money production responsible for the marked increase in the stock of M3. Throughout 2001, the annual growth in bank credit (excluding public sector entities) declined from 9.3% in January to 6.1% in December 2001 as overall economic activity decelerated, reaching 5.1% in May. Annual growth rates for bank credit to companies and private households decelerated as well. The favourable viewpoint that the ECB is widely believed to be keeping inflation on the expected path is currently shown by long-term bond yields, which – after making allowances for a certain degree of caution when interpreting the information content of asset prices – indi-

cate that inflation expectations continue to be linked to the ECB's price stability promise.

How the stock of M3 will respond as the "crisis scenario" peters out remains an open question. On the one hand, a decline in stock market volatility, favourable expectations regarding future stock market returns and a steepening of the yield curve should encourage portfolio adjustments, which should reverse the "excessive" holding of deposits included in M3. This, in turn, should bring the annual M3 growth rates back towards the reference value. However, such a portfolio readjustment could reduce annual M3 growth rates sharply, which might then indicate an overly restrictive monetary policy. Such a development would require the ECB Governing Council to provide a detailed explanation of monetary trends to the financial markets and the public at large. Needless to say, in the light of increasing "fundamental criticism" regarding the role of M3 in ECB strategy, it will take some effort on the part of the ECB Governing Council to position M3 as a prominent variable in its policy strategy.

If, however, investors do not adjust their portfolios to pre-crisis levels, annual M3 growth rates will remain at relatively high levels – well above the 4.5% reference value – for a prolonged period of time. For instance, if the stock of M3 were to expand at a month-on-month rate comparable with the annual 4.5% reference value (a monthly rate of 0.375%) from May 2002 onwards, annual M3 growth rates would remain above the reference value for quite some time and would reach 4.7% in December (see Fig. 15). That said, there is a risk that annual M3 growth rates will not provide ECB policy makers with a straightforward yardstick for assessing inflationary pressure in the coming months.

Fig. 15: Annual "headline" M3 growth rates likely to remain distorted for quite some time



Data source: ECB; own calculations. Assuming that month-on-month M3 growth rates amount to 0.375% as from May 2002.

Box X: ECB President Wim Duisenberg's early departure

On 7th February 2002, the ECB announced that ECB President, Wim F. Duisenberg, would retire on 9th July, 2003. Under pressure from President Jacques Chirac of France, who opposed his nomination back in 1998, Mr Duisenberg is widely reported to have made a reluctant promise to step down before the completion of his term in 2006. Since then, Mr Duisenberg has consistently denied Mr Chirac's version of events, according to which the Dutch central banker agreed to retire at some point in 2002 after the introduction of Euro banknotes and coins. Mr Duisenberg had previously indicated that he would not serve his full eight-year term, which expires in 2006. Thus, the ECB President's decision to step down did not come as a major surprise to most market observers. And even though Mr Duisenberg's early departure did not spark any obvious unfavourable market movement, his decision might not be without potential problems.

In general, the struggle of national governments over endowing the ECB's Governing Council with national representatives is hard to align with the philosophy of a monetary policy across the whole Euro zone, in which the central bank's primary objective is maintaining price stability. Moreover, national governments have appeared to be relatively unconcerned about the potentially unfavourable side effects that a public debate dominated by national rather than Euro zone concerns might entail for the reputation of the ECB. Most importantly, however, the politically engineered early departure of the ECB's first President is clearly against the spirit of the Treaty, i.e. the ECB-ESCB Statute.

In this context it seems important to note that the terms of members of the ECB Governing Council, including the President, as outlined in the Treaty and the ECB-ESCB Statute have been deliberately chosen to make sure that ECB policy makers serve longer terms than any national politicians. The intention of this, inter alia, is to reduce ECB members' open flank to potential political pressure. This kind of institutional design is actually an important pillar of the ECB's perceived political independence (see ECB OBSERVER No 1, pp. 5). Therefore, it seems economically unwise to subject ECB Governing Council members' terms to any kind of political "horse trading". The costs associated with such manoeuvring (such as a loss in confidence in the policy announced) may not come to the surface yet – but the possibility that they may do so at some point cannot be ruled out: "there is no such a thing as a free lunch", as the saying goes.

2. Shadows on the long-term stability outlook: a blow to the European Stability and Growth Pact

In February 2002, Germany avoided a European Union reprimand over the country's increasing budget deficit. The Council of European Finance Ministers (Ecofin) confirmed that they would not be issuing a formal budget warning to Germany, or to Portugal, after both countries pledged to respect EU rules that cap government deficits. The dispute erupted when the EU Commission raised the issue of official warnings to Germany and Portugal about their budget deficits. The Commission expects the German deficit to come in at 2.7% of gross domestic product in 2002, dangerously close to the 3% ceiling set out in EU budget rules.

To mollify EU partners' concerns, Germany stressed its commitment to the rules and its intention to keep its deficit below 3% of GDP by reining in spending by its federal states. The government pledged that the country would endeavour to adhere to its earlier commitment to balance its budget by 2004. The German government had already angered the Commission by saying that it no longer believed it would be able to balance its budget before 2006. Even in view of the new promises made, there should be widespread doubt as to whether Germany, and potentially other European governments too, will actually be able to meet the commitments imposed by the spirit of the European Stability and Growth Pact ("Pact") in the years to come. These concerns

have been reinforced in view of the fact that the French government has now proposed to balance its budget in 2007 rather than in 2004 as originally expected.

We have maintained the view that the Maastricht Treaty has successfully forced national governments to embark on a policy of fiscal consolidation, and that the Pact is the logical continuation of this badly needed policy course. From our point of view the Pact represents a "productive rule", aiming to reduce negative externalities inherent in governments' economic incentive to build up debt. Moreover, we think it is of the utmost importance that Euro zone governments not only adhere to the obligations of the Pact but that governments immediately start reducing their debt. Deviations from this consolidation course could ultimately translate into a serious risk to the ECB's credibility in the medium to long-term. This conjecture is based on the idea that unsustainable fiscal policy will ultimately raise doubts about the ability of the central bank to purse a monetary policy that is focused on price stability.

Recent experience has made it all too clear that peer pressure, which was previously considered to be an important factor in enforcing the Pact's requirements, has actually been much less effective than was originally thought. In fact, it does not seem too far-fetched to assume that the political decision not to enforce the early warning procedure envisaged by the Pact has definitely sent out the wrong signal and may already have severely undermined the Pact's credibility. Individual countries may now feel less inclined to stick to the requirements of the Pact given that a relatively low penalty is to be expected if a country does not comply with the Pact's requirements.

As we have argued before, Euro zone governments should start reducing outstanding debt in order to reduce the risk of their public finances coming under severe strain as a result of the foreseeable demographic trends in most of the Euro zone countries. For example, the ECB has drawn attention to conservative estimates for the increase in spending related to an aging population of at least 6.0% of GDP per annum on average for the Euro zone in the coming decades (see ECB, March 2002, p. 52). Moreover, a still relatively high burden of government debt and its associated costs – taxes, allocative distortions, etc. – will be a drag on real economic growth going forward. It would be a favourable signal for the Euro zone's growth perspectives and, most importantly, for the ECB's stability efforts if governments would supplement the Pact's current obligations by further, i.e. even more far-reaching, requirements to reduce government debt.

3. Looking ahead: inflation and ECB rates

Below, we provide the results of our inflation forecasting model for Euro zone inflation in the coming 12 months. The model was presented in detail in our last report. Theoretically, the model represents an extended version of the "price gap" or "P-star" model, which has been widely discussed in economic literature (see Box 4 for a brief introduction). Most importantly, the model assumes a stable trend in the money demand function, i.e. the velocity of money, and that future inflation is driven by money overhangs which have been built up in the past. To make allowance for "cost push" factors affecting the price level in the short to medium term, the model incorporates the output gap, the EUR/USD exchange rate and the oil price.

Box 4: A brief introduction to the P-star model

The general idea of the P-star model (see Hallman, Porter and Small (1989 and 1991) and Tödter and Reimers (1994)) was adopted by the Deutsche Bundesbank (1992) and integrated into its monetary policy (see Issing, 1992 und 1995). The P-star model is based on the quantity theory, differentiating between a short and long-term equilibrium transaction equation. According to the long-term equation, the long-term equilibrium price level (P*) depends on the actual stock of money (M), the long-term velocity (V*) and the long-term, i.e. potential output (Y*) given by:

(1) $P^* = M \cdot V^* / Y^*$, or in logarithms,

(2) $p^* = m + v^* - y^*$.

By analogy, the short-term transaction equation is given by:

(3) $p = m + v - y$.

The short-term price level is determined by the actual value of the variables under review. Deviations between long and short-term variables are represented by the difference between (2) and (3):

(4) $p - p^* = (y^* - y) + (v - v^*)$.

The left-hand side term of the equation (3) shows the "price gap". The output gap ($y^* - y$) and the liquidity gap ($v - v^*$) are shown on the right-hand side. The price gap can be explained by the interrelationship of the output gap and the liquidity gap. Deviations between actual p and p* indicate future acceleration or deceleration of inflation (provided p and p* are co-integrated).

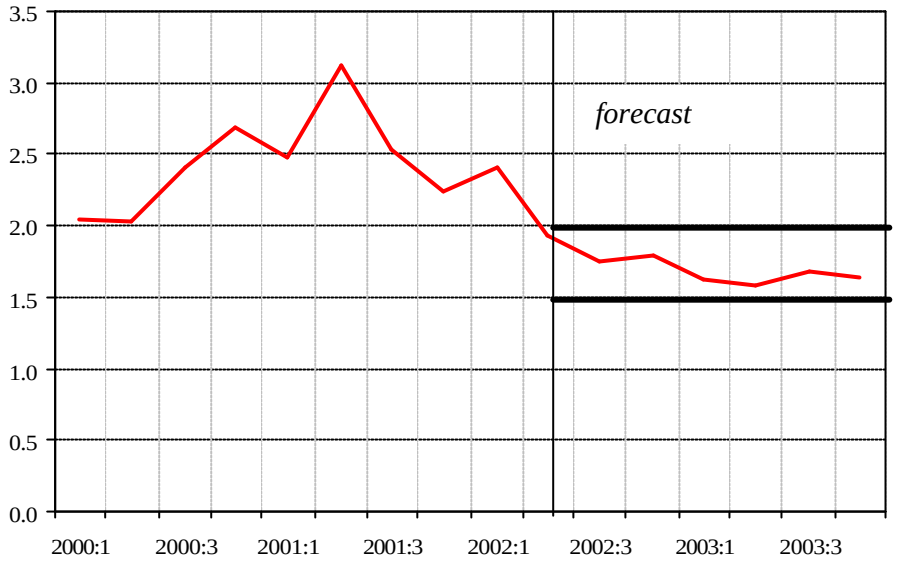
It is frequently argued that if actual output is higher (lower) than potential output, that is $y > y^*$ ($y < y^*$), the price gap will become negative (positive), $p < p^*$ ($p > p^*$), thus increasing the future price level. However, some caution is required here. Given that $y > y^*$ ($y < y^*$), the actual velocity of money will rise above (decline below) its long-term value: $v > v^*$ ($v < v^*$). This is because the growth in output affects the velocity directly:

$v = y + p - m$ and

$v^* = y^* + p^* - m$.

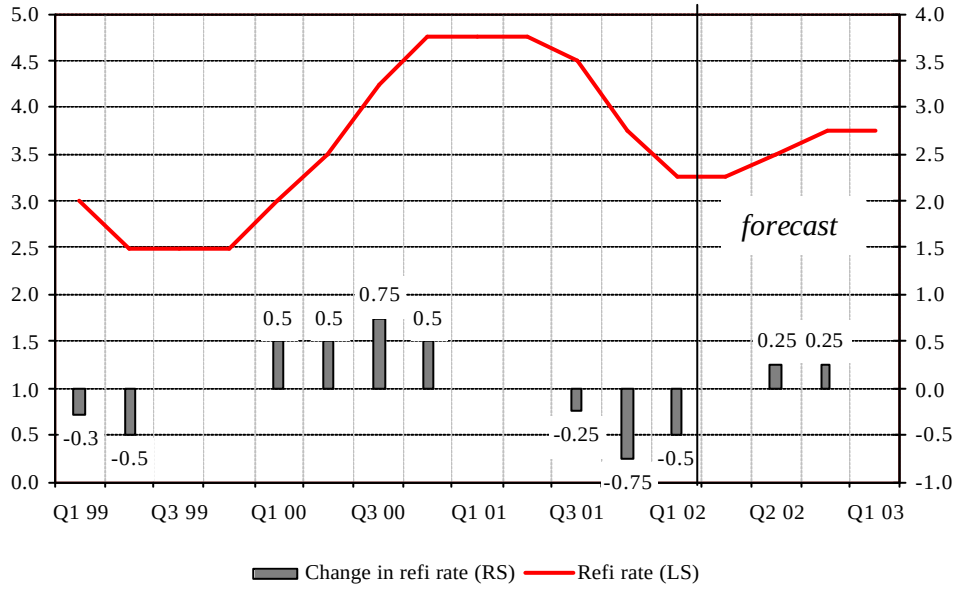
As a result, given unchanged growth in the money supply and a stable velocity, the output gap will be compensated for by the liquidity gap. Changes in output, i.e. the output gap, cannot therefore change the price level on a sustainable basis. The only reason why the price level should be altered can be found in a change to the money supply. For example, an increase in the money supply induces excess balances in the portfolios of economic agents, e.g. a decline of v below v*. As economic agents try to get rid of their excess balances the additional money supply must translate into an increase in the price level as the economy runs at full potential. From the point of view of the P-star model, changes in the price level are solely due to monetary overhangs.

Fig. 16: Euro zone inflation (acutal and estimated), 2000:Q1 to 2003:Q4



Source: own estimates.

Fig. 17: ECB refinancing rate (LS) and changes in ECB refi rate (RS) for the period 1999:Q1 to 2002:Q4



Our forecast is based on the assumption that (i) the oil price remains at around 25.5 US$ per barrel, (ii) real GDP growth increases from 1.0% y/y in 2002:Q1 to 2.5% y/y in the middle of 2003 and (iii) the EUR/USD exchange rate remains around 0.9. Moreover, in view of the recent distortions in the stock of M3 due, inter alia, to high volatility on the stock markets, we estimated "adjusted" annual M3 growth rates which move towards 5.5% until the end of 2002 (based on an assumed ECB interest rate increase of 50bp). Under these assumptions, the model predicts that Euro zone inflation will remain below the ECB's 2.0 percent ceiling for the foreseeable future.

More specifically, inflation can be expected to decline to 1.9% y/y in 2002:Q2, 1.7% in Q3, 1.8% in Q4 and to decline still further to around 1.6% in the course of 2003.

We expect the ECB to raise rates slightly in the course of this year. We would like to mention three major inter-related reasons for this forecast:

- Firstly, in view of a widely expected recovery of the Euro zone economy, the ECB will be eager to implement a pre-emptive policy. This is particularly the case because policy makers may not feel an incentive to avoid another overshoot of inflation on an average annual basis given the inflation performance in recent years.
- Secondly, an economic recovery will increase the ECB's concerns about the impact M3 overhangs will exert on future inflation. In line with Bundesbank practices, the ECB is most likely to interpret the M3 overhang as necessitating the implementation of a policy to push monetary expansion towards their reference value.
- Thirdly, the ECB may feel uncomfortable with the current interest environment, given that it was established first and foremost as a response to exceptional circumstances in late 2001.

However, we do not expect the ECB to raise rates by more than 50bp in the remainder of this year, and such an increase in banks' funding costs should be compatible with underlying economic trends in the Euro zone and the objective of allowing the annual rise in the consumer prices index to reach no more than 2.0 percent in the medium-term.

Schedules for the meetings of the Governing Council and the General Council of the ECB and related press conferences in 2002

The **Governing Council** has agreed that in the year 2002 its meetings will continue to be held, as a rule, on **alternate Thursdays**. As in 2001, **exceptions** to this rule are envisaged in order to accommodate special holiday situations. Two meetings will again be held outside Germany. As already announced, the Governing Council will meet on 7 February 2002 in Maastricht and on 4 July 2002 in Luxembourg. These meetings will be hosted by De Nederlandsche Bank and the Banque centrale du Luxembourg respectively.

In addition, the **General Council** has agreed that the current practice of having quarterly meetings is to be maintained.

Finally, the current regime for holding **press conferences** will continue, i.e. they will take place **after the first Governing Council meeting of each month, with the exception of August**.

Meetings of the Governing Council of the ECB in 2002

3 January 2002
17 January 2002
7 February 2002 (Maastricht)
21 February 2002
7 March 2002
21 March 2002
4 April 2002
18 April 2002
2 May 2002
16 May 2002
6 June 2002
20 June 2002
4 July 2002 (Luxembourg)
18 July 2002
1 August 2002
29 August 2002
12 September 2002
26 September 2002
10 October 2002
24 October 2002
7 November 2002
21 November 2002
5 December 2002
19 December 2002
9 January 2003

Meetings of the General Council of the ECB in 2002

21 March 2002
20 June 2002
26 September 2002
19 December 2002

Press conferences in 2002

3 January 2002
7 February 2002 (Maastricht)
7 March 2002
4 April 2002
2 May 2002
6 June 2002
4 July 2002 (Luxembourg)
12 September 2002
10 October 2002
7 November 2002
5 December 2002
9 January 2003

Source: ECB.

ECB OBSERVER – *recent publications*		
Number	Title and content	Date of publication
No. 3	**The Fed and the ECB – why and how policies differ** *Content: 1. The US Federal Reserve System and the European System of Central Banks – selected issues under review. – 2. The reaction functions of the US Fed and ECB. – 3. The influence of monetary policy on consumer prices. – 4. ECB rate policy and Euro zone inflation perspectives.*	24 June 2002)
No. 2	**Can the ECB do more for growth?** Content: *1. Should the ECB assign a greater role to growth? – 2. Government finances and ECB policy – a discussion of the European Stability and Growth Pact. – 3. "Price gap" versus reference value concept. – 4. Assessment of current ECB policy and outlook.*	19 November 2001
No. 1	**Inflationsperspectiven im Euro-Raum** Content: *1. Warum die EZB-Geldpolitik glaubwürdig ist. – 2. EZB-Strategie – Stabilitätsgarant oder überkommenes Regelwerk? – 3. Stabilitätsrisiken der Osterweiterung. – 4. Zinspolitik der EZB in 2001 und 2002.*	17 April 2001

ECB OBSERVER –

objectives and approach

The objective of ECB OBSERVER is to analyse and comment on the conceptual and operational monetary policy of the European System of Central Banks (ESCB). ECB OBSERVER analyses focus on the potential consequences of past and current monetary policy actions for the future real and monetary environment in the Euro zone. The analyses aim to take into account insights from monetary policy theory, institutional economics and capital market theory and are supplemented by quantitative methods. The results of the analyses are made public to a broad audience with the aim of strengthening and improving interest in and understanding of ECB monetary policy. ECB publishes its analyses in written form on a semi-annual basis.

ECB OBSERVER –

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