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Bernd Hayo*

European Monetary Policy: Institutional Design and Policy Experience

The following article examines design issues relevant to European monetary policy: central bank independence, and the accountability and transparency of monetary policy strategy. An empirical approach is then applied which allows a comparison between the ECB and other central banks. It also enables an investigation of whether the ECB simply follows the US Federal Reserve Bank, as is sometimes claimed.

When the European Monetary Union (EMU) was founded in January 1999, the expectations of some commentators were very pessimistic, while others expressed great hope. Four and a half years down the road, both positions proved to be wrong. Neither has EMU led to any disasters nor did it dramatically revitalise the European economy. Is that a surprise? Not really, as none of the extreme views were built on a convincing analysis of the underlying issues. Still, even leaving all the hype behind, EMU can be considered the most important institutional event in monetary economics since the breakdown of Bretton Woods. The European Central Bank (ECB) now determines monetary policy in twelve European countries, with perhaps many more to come after the enlargement of the European Union (EU).

What conclusions emerge with respect to European monetary policy? Here the two major variables of interest are inflation and output. Regarding inflation, no great inflationary waves could be observed so far. The average inflation rate since the creation of EMU is slightly below two percentage points. Hence, the ECB has fulfilled its objective of maintaining price stability. The verdict with respect to its achievements in the area of output stabilisation is more controversial. The European economy as a whole has been growing rather slowly since 1999 and it has been suggested that the ECB puts too much emphasis on inflation and not enough on the development of output in the euro area.

The aim of this paper is to provide an evaluation of ECB monetary policy. This objective is approached from two directions. First, design issues relevant to European monetary policy are re-examined. The importance of central bank independence as a founding

principle of the ECB and its likely effect on inflation over the longer run is critically analysed. In addition, concepts such as accountability and transparency of monetary policy are discussed from the point of view of European monetary policy. Here, the monetary policy strategy plays an important role. Second, using an empirical approach, it will be attempted to characterise ECB monetary policy using so-called "Taylor rules" or reaction functions. Basically, interest rate setting is explained by the development of the core economic variables mentioned above, namely inflation and output. Using such an approach allows a comparison between the ECB and other central banks. It also enables an investigation of whether the ECB simply follows the US Federal Reserve Bank, as is sometimes claimed.

The ECB and Central Bank Independence

An important guiding principle in the institutional design of the ECB was the idea of central bank independence (CBI), i.e. the conduct of monetary policy by the central bank without interference from the government. The prominent role of CBI can be traced back to two factors: the Bundesbank and the focus of the academic literature in the late 1980s on the so-called time-inconsistency problem. Perhaps the only way to ensure that the Germans would go along with forming EMU, in spite of heavy internal resistance originating from both the general population and the economics profession, was to transfer the institutional set-up of the Bundesbank to the ECB. The Bundesbank had earned respect not only in Germany but also abroad, where its inflation record was considered a great achievement.

At the beginning of the 1990s, the Treaty of Maastricht was at the top of the agenda. At that time, many countries had already tied their monetary policies to the Bundesbank through an exchange rate commitment in the European Monetary System (EMS). While the EMS experienced a number of parity changes

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after its creation in 1979, the last adjustment of the exchange rate parities before the decision on EMU occurred in 1986. When the system experienced major disruptions in September 1992 and 1993, it was widely believed that the interest rate policy of the Bundesbank after German re-unification had given the EMS its critical blow. So while its primary focus on inflation was widely endorsed, it became obvious that the Bundesbank was guided in its monetary policy decisions only by macroeconomic developments in Germany. Consequently, the other EMS member countries preferred a central bank that acted like the Bundesbank with respect to inflation, but also took conditions in all other EMS countries into account. Thus, Germany and the other EMS countries could agree on the institutional design of the ECB relatively easily.

The focus on creating an independent central bank also received strong support from academic research on monetary policy at the time. Empirically, studies found a negative correlation between the degree of CBI and average inflation. Theoretically, the so-called time-inconsistency problem was considered a major obstacle in the quest for low inflation.¹ It basically says that welfare maximising policymakers have an incentive to increase employment to above normal by creating surprise inflation after private players fixed their nominal contracts. This generates an inflation bias in monetary policymaking.

One solution to this problem was to employ a central banker whose preferences are much more tuned to inflation than society's.² A necessary condition for him to be able to do his job is to grant him independence in his monetary policy decisions from a welfare maximising government. The time-inconsistency issue was considered by some observers to be a more than sufficient reason to adopt CBI. This theoretical concept is intriguing and widely accepted. However, while there is empirical evidence that, at least for OECD countries, more independent central banks experi-

ence lower inflation, no test has shown that this is due to time-inconsistency problems.³

Critical Voices

Since the heyday of CBI enthusiasm, more critical voices can be heard.⁴ The criticism comes from two directions. First, the construction of the underlying CBI indicators raises numerous and non-trivial methodological questions.⁵ Moreover, in samples containing Third World countries, the association between a high degree of CBI and low inflation rates is no longer present. Other indicators, such as the turn-over rate of central bank governors are much more successful in explaining average inflation rates across countries.⁶ This already indicates that formal or *de jure* CBI only impacts on inflation under specific conditions that prevail, on average, in OECD countries but not in the rest of the world.

In general, *de facto* and *de jure* CBI can differ substantially, and the above argument on CBI only holds if these two are highly correlated. Recent theoretical and empirical research on the independence of the legal system shows that *de jure* judicial independence is an imperfect measure of *de facto* judicial independence.⁷ Given the differences in empirical findings between OECD countries and the rest of the world, one can conjecture that *de jure* CBI is an imperfect indicator of *de facto* CBI.

Second, even if *de jure* CBI is the right measure and if it is measured correctly, the question remains whether it causes low inflation or whether it is itself driven by an underlying factor that differs between countries. Two explanations for different degrees of CBI are offered in the literature: interest group politics and different inflation preferences of societies. The interest group explanation argues that interest groups prefer different degrees of price stability and will thus lobby for a central bank design that presumably generates the preferred inflation rate.⁸ For instance, the financial sector is likely to have a stronger inflation aversion

¹ R. Barro, D. Gordon: Rules, discretion, and reputation in a positive model of monetary policy, in: *Journal of Monetary Economics*, Vol. 12, 1983, pp. 101-121.

² K. Rogoff: The optimal degree of commitment to an intermediate monetary target, in: *Quarterly Journal of Economics*, Vol. 100, 1985, pp. 1169-1190.

³ It should be stressed that testing the time-inconsistency problem empirically is conceptually extremely difficult if not impossible. To my knowledge, the only serious attempt to evaluate the extent of this problem in a simulation study is: S. Albanesi, V.V. Chari, L.J. Christiano: How severe is the time inconsistency problem in monetary policy?, NBER working paper 8139, 2001, within the framework of a dynamic macroeconomic model. They find issues of time-inconsistency to be of importance for only very limited parameter ranges.

⁴ B. Hayo, C. Hefeker: Reconsidering central bank independence, in: *European Journal of Political Economy*, Vol. 18, 2002, pp. 653-674.

⁵ J. Forder: On the measurement and assessment of 'institutional' remedies, in: *Oxford Economic Papers*, Vol. 48, 1996, pp. 39-51.

⁶ See A. Cukierman: *Central bank strategy, credibility, and independence*, Cambridge 1992, MIT Press; J. De Haan, W.J. Kooi: Does central bank independence really matter? New evidence for developing countries using a new indicator, mimeo, University of Groningen, 1998.

⁷ B. Hayo, S. Voigt: Explaining *de facto* judicial independence, Discussion Paper 46/03, Department of Economics, University of Kassel, 2003.

than other groups in societies. It follows that countries with a relatively strong financial sector will implement high degrees of CBI. The other explanation of why CBI varies between countries traces support for CBI back to differing preferences. For historical and cultural reasons, societies differ in their preference for low inflation and will therefore implement different degrees of CBI as a reflection of these.⁹

Interest Group Lobbying

If these critical approaches to CBI turn out to be empirically relevant, what will be the consequences for inflation in the euro area? First, consider the interest group argument. If the financial sector is relatively strong and lobbies the ECB successfully it will affect the stance of monetary policy towards low inflation in Europe. However, other groups with different interests, such as trade unions, compete with the financial sector in the lobbying market. Since all interest groups were only familiar with lobbying activities within the national domain, they presumably would need some time to organise and lobby effectively at the European level. Indeed, an empirical study fails to find much interest group pressure on the ECB.¹⁰

However, it seems likely that it will be only a matter of time until the interest groups overcome their problems of collective action at the European level.¹¹ How long will it take before lobbying groups work effectively at the European level? This is difficult to say, of course, and no attempt will be made here to provide any estimates.

It should be noted, though, that it may not always be necessary for interest groups to unite across national boundaries to perform successful lobbying activities at the supranational level. In many areas of European policymaking, the European level is often nothing more than a collection of national representatives. Thus, under these conditions it is sufficient that national interest groups lobby their respective national representative and in the aggregate the result will be the same as influencing supranational decisions

directly. In the case of European monetary policy, decisions are made by the Governing Council, which is dominated in voting power by the national central bank presidents. If these are influenced by the respective national interest group and if this is undertaken in a coordinated way, the result will be as effective as under a situation of direct supranational lobbying.

Which interest groups are going to be the most successful? That question is somewhat difficult to answer. The ease of organisation of group interests facilitates lobbying and raises the political influence of the group. Here the financial sector seems to be in a much better position than many other interest groups, in particular trade unions. The financial sector not only finds easy access to national central bank presidents but, through its interaction with the ECB, also to the members of the Directorate located in Frankfurt. This makes it likely that the current focus of monetary policy on the achievement of price stability will remain in place for the foreseeable future.

Varying Inflation Preferences

What about the alternative approach to explaining different degrees of CBI, namely varying inflation preferences across countries? In a public choice study, predictions have been made about future inflation in the euro area.¹² It is argued that average inflation will increase compared to what Germany has experienced under the Bundesbank. In deriving these predictions about future inflation rates in Europe estimates of inflation attitudes are used, among many other sources of information. However, these estimates of attitudes are treated as reflecting "deep" preferences and assumed to be fixed. This is a strong assumption that is unlikely to be met in practice.

But if these inflation attitudes are not time-invariant, in which direction will they change? Assuming that there is convergence, will inflation attitudes move towards those of the more stability oriented countries, such as Germany and the Netherlands? While there is no recent evidence on this issue, an earlier study suggests that even before EMU a convergence of inflation preferences towards the German level was taking place in Europe.¹³ A growing consensus within the European population on making stable prices an important objective will ease the task of the ECB and

⁸ A. Posen: Declarations are not enough: Financial sector sources of central bank independence, in: NBER Macroeconomic Annual, Cambridge Mass. 1995.

⁹ B. Hayo: Inflation culture, central bank independence and price stability, in: European Journal of Political Economy, Vol. 14, 1998, pp. 241-263.

¹⁰ P. Maier, S. Bezoen: Supporting and bashing of central Banks: The Bundesbank and the European Central Bank, mimeo, De Nederlandsche Bank, 2003.

¹¹ See M. Olson: The Rise and decline of nations, New Haven 1982, Yale University Press.

¹² R. Vaubel: The future of the euro: A public choice perspective, Discussion Paper 570/99, University of Mannheim, 1999.

¹³ B. Hayo: Empirische und Theoretische Studien zur Europäischen Währungsunion, Frankfurt 1998, Peter Lang.

provide invaluable support if it has to face political pressure.

To summarise, even if one does not believe in the orthodox explanation of the cause of inflation differences between countries, it is re-assuring that even alternative approaches do not provide much reason for concern that excessive inflation will easily sweep through Europe again. Looking at the ECB's inflation record using monthly year-to-year growth rates from January 1999 to May 2003 yields an average of 1.97 for the arithmetic mean. If the (correct) geometric mean is applied, the average inflation rate has an even lower value of 1.88.

This figure is below the inflation target of two per cent which the ECB has set for itself. In its announcement of 8 May 2003, the ECB clarified its target as "below, but close to 2%", taking into account that an inflation rate close to zero is unlikely to be a good choice. To name but two arguments against a zero inflation target: there may be an upward bias in the measurement of consumer prices. For instance, in the USA this was measured as amounting to about one percentage point in the period 1995-96.¹⁴ So far, the ECB has not provided concrete estimates of the measurement bias for the euro area.¹⁵ The convergence of national price levels due to monetary union, the so-called Balassa-Samuelson effect, implies that allowance should be made for relative price changes in member countries. An inflation target that is too ambitious might lead to deflation in those countries with a relatively higher price level.

So all in all, the inflation objective of the ECB has been well met so far. However, one implication of the high degree of CBI for the ECB is that the central bank itself can set the inflation target. So in light of the actual average inflation rate it might not be purely coincidental that the definition of the inflation target has been clarified as being close to two per cent and not, say, in the middle between zero and two per cent inflation. Specifying the inflation target in this way can also be interpreted as justifying ECB policy *ex post*. However, as argued above, a more ambitious target than two per cent is not warranted, and even if the ECB has initiated this re-interpretation of its inflation target based on *ex*

post justification motives, this change should be welcomed nevertheless.

Central Bank Accountability and Transparency

The concept of central bank accountability has received considerable attention in recent years.¹⁶ Accountability is tightly linked to CBI as, at least in principle, an independent central bank can do what it wants. A society that is willing to confer the execution of monetary policy to independent central bankers needs to maintain some form of monitoring or control. This is the well-known principal-agent problem, where the principal, the population or the government, delegates the responsibility for monetary policy to another agent, an independent central bank.

Which measures keep an independent central bank accountable for its actions? Can monetary policy decision-makers be held responsible in case of serious policy errors? Are they trying to achieve the best for society? In the Rogoff framework, the preferences of the conservative central banker and those of the society diverge by definition. But society must at least know the preferences of the central banker in order to choose the best appointment. Since preferences cannot easily be revealed *ex ante*, the candidate's track record is often the only thing from which the necessary conclusions can be drawn. In the case of the ECB, accountability does not play a prominent role, and some observers have argued that it suffers from a democratic deficit.¹⁷

To fulfil his accountability obligations, the ECB president has to appear in front of the Committee on Economic and Monetary Affairs of the European Parliament to provide a testimony of economic conditions in Europe and monetary policy decisions and then stand ready to answer questions from the committee members. If dissatisfied, the Committee cannot do much more than to express its discontent and make it public, as the ECB is independent. In that sense, the accountability of the ECB is rather limited. A non-systematic evaluation of these testimonies gives the impression that the ECB is not truly held accountable for its performance regarding European monetary policy.

¹⁴ M.J. Boskin, E.R. Dulberger, R.J. Gordon, Z. Griliches, D.W. Jorgenson: Towards a more accurate measure of the cost of living, Final Report to the Senate Finance Committee from the Advisory Commission to the Study of the Consumer Price Index, 1996.

¹⁵ See G. Camba-Mendez: The definition of price stability: Choosing a price measure, ECB Background Paper, Frankfurt 2003, ECB.

¹⁶ See C.B. Briault, A.G. Haldane, M.A. King: Independence and accountability, Bank of England Working Paper 49, 1996; A. Muscatelli: Optimal inflation contracts and inflation targets with uncertain central bank preferences: Accountability through independence?, in: Economic Journal, Vol. 108, 1998, pp. 529-42.

¹⁷ P. Kenen: Economic and monetary union in Europe, New York 1995, Cambridge University Press.

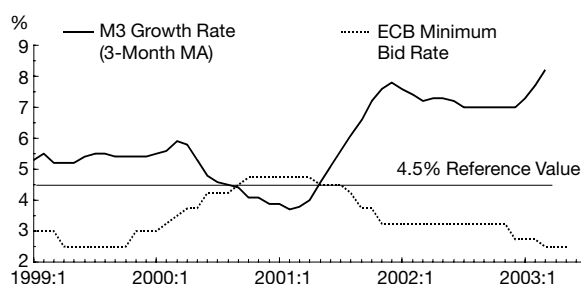
Accountability is related to the extent of transparency in monetary policy decision-making.¹⁸ Here the core issue is whether increasing transparency is beneficial to the conduct of monetary policy or not. In general, transparency is a pre-condition for improved accountability under conditions of CBI, as otherwise it is very difficult to monitor central bankers. Transparency is also useful in terms of private sector adjustment to shocks, as players can more easily distinguish between policy induced and external (sector specific) shocks. However, what actually constitutes good practice is still under debate as an exchange between the British view and the ECB view reveals.¹⁹

Monetary Strategy

To some extent, the degree of transparency of central bank actions depends on the monetary policy strategy. The monetary policy strategy of a central bank can be interpreted as a communication device that enables outside observers to understand and even anticipate policy moves. The ECB has adopted a strategy based on two pillars. The first pillar is a monetary reference value based on a smoothed growth rate of the monetary aggregate M3. The second pillar rests on a range of indicators that help to forecast inflation, such as wage inflation, oil prices, exchange rate movements, and the like. This two-pillar strategy has been heavily criticised by external observers of European monetary policy. A core criticism is based on the apparent arbitrariness of decisions based on such a broad menu of macroeconomic indicators. It seems possible to justify almost any policy decision by referring to a convenient selection of indicators supporting that choice. Such an approach undermines the transparency and accountability of ECB decision-making. While critics are relatively united in their scepticism with respect to the two-pillar strategy, there is less unanimity concerning the question of which of the two pillars the ECB ought to focus on.²⁰

Figure 1 highlights the inconsistencies in the use of the first pillar of the ECB's monetary policy strategy. The ECB minimum bid rate and the three-months moving average of M3 growth are plotted together.

Figure 1
ECB Minimum Bid Rate and Growth of M3



The horizontal line represents the 4.5% reference value for M3 growth as set by the ECB.

If money played a decisive role in interest rate setting, one would expect to see interest rates following M3 in the same direction. In other words, as soon as money grows above the reference value for some time, interest rates should increase. The graph suggests a different interpretation, namely an inverse relationship between these two variables. The correlation coefficient between the two series has a value of -0.58 , supporting this conclusion. However, it might be unfair to look for an impact of current money growth on current interest rate setting, as money growth fulfils a role in the longer term only. But even allowing for such a longer term perspective of money growth, no obvious inference from money growth to interest rate setting appears possible. In this interpretation, the two-pillar strategy is a failure, as it does not help to communicate monetary policy decisions to the public. Knowing money growth figures even over longer time-periods does not help to anticipate interest rate decisions. Instead, the ECB has introduced other means of communication with the private sector, such as informal comments on the likely stance of the Governing Council. This is all very well, but it makes the monetary policy strategy as a communication device all but redundant.

There is another interesting conclusion that emerges from Figure 1: money does react to changes in the interest rate. Hence, it is not money growth leading interest rates but the other way around. So whatever the causes that keep money growth persistently above the reference value (the ECB's pet explanation is portfolio shifts towards more liquid funds due to uncertainty on financial markets) money can be influenced by monetary policy actions. This sheds additional light on the question of why the ECB's monetary policy strategy is unsatisfactory. Clearly, what is lacking is the will to use interest rate hikes to bring money growth closer to the

¹⁸ P. Geraats: Central bank transparency, in: *Economic Journal* Vol. 112, 2002, pp. 532-565.

¹⁹ See W. Buiter: Alice in Euroland, in: *Journal of Common Market Studies* Vol. 37, 1999, pp. 181-209; O. Issing: The Eurosystem: Transparent and accountable or 'Willem in Euroland', in: *Journal of Common Market Studies*, Vol. 37, 1999, pp. 503-519.

²⁰ For instance, among the ECB watch groups, the EMU Monitor favours a focus on money, while the CEPR group argues for an explicit inflation target.

reference value. The reason is that the level of interest rates needed to bring about such a growth rate is considered to be excessively high. Ruling out higher interest rates leaves the ECB with only two choices if it wants to generate some credibility for its strategy: either abandon the first pillar or increase the reference value.

Different Roles of the Two Pillars

Partly as a reaction to the criticisms of its monetary policy strategy, the ECB has recently provided a re-evaluation (see the ECB Press Statement of 8 May 2003). The ECB now emphasises the different roles of the two pillars. The monetary reference value is a guide to the monetary developments consistent with the *long-run* inflation target, whereas the second pillar serves to describe the *short-run* determinants of inflation. In addition, the order of the two pillars has been reversed, as the monetary reference value will now only be used to check the plausibility of the forecast from the short-run inflation analysis. To underline its long-run nature, the reference value will no longer be re-assessed every year but only when the need arises. It remains to be seen whether these changes are going to calm the critics.²¹

In light of the two choices outlined above to increase the credibility of the monetary policy strategy (revise the reference value upwards or abandon the first pillar) one interpretation is that the ECB has all but discarded the monetary pillar and now relies on an inflation target for all practical purposes. So far, the analysis of the monetary policy environment in the Monthly Bulletin of the ECB shows little change, as money growth is still being discussed first. In addition, the economic analysis of inflationary forces does not have the same focus as, for instance, the fan chart of inflation forecasts provided by the Bank of England.²² Hence, in its present state, the revision of the monetary policy strategy is not going to have the desired effects. One recommendation to the ECB is to make the changes in the strategy more visible in its publications and announcements. This might help to finally implement a strategy that does what it should, namely to communicate ECB monetary policy moves successfully to the markets.

In the light of the above discussion, it has to be concluded that the ECB's monetary policymaking is not

very transparent. The Bank of England, for example, has adopted an explicit inflation target coupled with the regular publication of its inflation forecasts and of the minutes of the Monetary Policy Committee. This leads to a greater degree of transparency than the current practice of the ECB. In the case of the ECB, neither is the revised two-pillar monetary strategy very transparent nor are the minutes of the Governing Council published.²³

This raises the question about the optimal degree of central bank transparency. So far, the benefits of greater transparency have been stressed. However, more transparency in monetary policymaking does not necessarily increase its effectiveness. For example, lack of transparency or uncertainty about monetary policy actions may also help the central bank to achieve price stability. Assuming that labour market negotiations are highly coordinated, trade unions will moderate their wage demands if they do not know how the central bank will react to the resulting upward pressure on prices.²⁴ Coordinated wage negotiations by trade unions are the rule in EMU member countries, while this is not the case in the UK. Consequently, it can make sense to be somewhat less transparent in the case of the ECB. The attempt to restrain trade unions by increasing the monetary policy response to wage inflation will not work in the case of decentralised trade unions, for example in the UK, as they do not take the effect of their wage settlements on aggregate wages into account.²⁵ Thus, the optimal degree of transparency may depend on the economic structure of countries, for instance on their labour market institutions.

To summarise, the ECB is not very accountable in its monetary policy actions. In addition, the transparency of its policy decisions is at least debatable, as the monetary policy strategy does not fulfil its role properly. Whether recent adjustments in its monetary strategy are going to substantially change that conclusion remains to be seen. Here the ECB is called upon to strive for greater clarity in the implementation of the revised strategy. The new emphasis on the second

²¹ See C. Hefeker: The ECB's new strategy, in: INTERECONOMICS, Vol. 38, No. 2, 2003, pp. 114-115.

²² A summary of the discussions surrounding the ECB monetary strategy is provided by the ECB: Overview of the background studies for the reflections on the ECB's monetary policy strategy, ECB Web Site, 8 May 2003.

²³ It cannot be taken for granted that relevant information would be revealed by publishing the minutes, as they would be edited and any information that is not intended to reach a wider audience is unlikely to appear in the published minutes.

²⁴ H.-P. Gruner, B. Hayo, C. Hefeker: Monetary policy uncertainty and unionized labor markets, mimeo, University of Mannheim, University of Duisburg-Essen, and HWWA, 2003.

²⁵ A related argument is made by H. Jensen: Optimal degrees of transparency in monetary policymaking, in: Scandinavian Journal of Economics, Vol. 104, 2002, pp. 399-422.

pillar, the inflation forecasts, should be reflected in the relevant ECB publications. However, a more fundamental problem is the desirability of transparency. Recent research indicates that it is not clear whether the ECB should strive for maximum transparency if it wants to achieve low inflation rates.

What Determines Monetary Policy in Practice?

As argued above, the monetary policy strategy may help the public to understand and anticipate central bank decisions. Another approach to interpreting monetary policymaking that tries to cut through the official rhetorics is based on so-called Taylor rules or reaction functions.²⁶ This approach assumes that monetary policy is primarily interest rate policy. In order to understand monetary policy, it is therefore helpful to explain how short-term interest rates are determined. In particular, it is suggested that interest rates react to deviations by inflation and output from their targets. Nowadays, the weights on the variables driving interest rate decisions are not set by casual inspection but are instead based on empirical estimation. Reaction functions are widely applied to foster the interpretation of monetary policy in many countries of the world.²⁷ By now, there is sufficient data available to get a first impression of whether ECB monetary policy is well-described by standard findings on Taylor rules in the literature.

It has to be decided which interest rate best reflects the stance of monetary policy in the euro area. An obvious choice would be the minimum bid rate, as it directly reflects interest rate setting in the euro area. However, there are two problems with this approach. First, the ECB uses variable rate tenders, and the resulting interest rate may, and in fact usually does, depart from the minimum bid rate. This is due to the setting of fixed quantities of money that are allocated with those tenders. A second problem relates to the availability of data. Since it has become customary to include an indicator of expected inflation in the interest rate setting equation, namely the one year ahead inflation rate, a sufficient number of lagged variables are needed in the model as instruments. Given that there is no obvious precursor of the minimum bid rate before EMU, using lags inevitably reduces the number of available observations.

In view of these considerations, average monthly data of the daily interest rate in the euro area are used. The daily interest rate reflects both the effect of the minimum bid rate and the relative scarcity of liquidity. The following equation is estimated.

$$(1) \text{ interest rate}_t = \text{constant} + \beta_1 \text{ inflation}_{t+12} + \beta_2 \text{ output gap}_{t-1} + \beta_3 \text{ interest rate}_{t-1} + \text{error}_t$$

In addition to expected inflation (in %) and the lagged output gap (in %), we allow for interest rate smoothing by including the lagged dependent variable.²⁸ Since inflation one year ahead is not known at time t , this variable needs to be instrumented to avoid biased estimates. An instrumental variable estimation using data from 1999:1 to 2003:5 yields the following (standard errors in brackets).²⁹

$$(2) \text{ interest rate}_t = 0.15 + 0.17 \text{ inflation}_{t+12} \\ (0.32) \quad (0.11) \\ + 0.12 \text{ output gap}_{t-1} \\ (0.04) \\ + 0.87 \text{ interest rate}_{t-1} \\ (0.05)$$

Thus, the daily interest rate in the euro area depends positively on expected inflation, on the deviations of the last period's industrial production from its long-term level and on interest rates in the previous month. The coefficient of the lagged interest rate variable (0.87) implies that the smoothing element is slightly smaller than, but not statistically different from, those measured in the case of the Federal Reserve, the Bundesbank, and the Bank of Japan.³⁰ The constant term in (2) is insignificant. This could result from the relatively short estimation period, which may not contain sufficient information to compute an equilibrium nominal interest rate. While the estimate

²⁶ J. Taylor: Discretion versus policy rules in practice, in: Carnegie-Rochester Conference Series on Public Policy, Vol. 39, 1993, pp. 195-214.

²⁷ R. Clarida, J. Gali, M. Gertler: Monetary policy rules in practice: Some international evidence, in: European Economic Review, Vol. 24, 1998, pp. 1033-1067.

²⁸ Many studies employ the current value of the output gap. However, results are relatively robust to slight variations in the timing of the output gap, which is also the case here. The presented specification reduces the problems associated with instrumental variable estimations and exhibits better properties in terms of diagnostic tests.

²⁹ The data are from the ECB web site. The interest rate is the annualised daily interest rate in %, inflation is the annual growth rate of HCPI in %, the output gap in per cent is based on a Hodrick-Prescott filter ($\lambda = 1600$) of the industrial production index over the period 1980:1 to 2003:5. The instruments are six lags of the interest rate, output gap, inflation rate, growth of broad real effective exchange rate, and growth of oil prices in euros. A Sargan test does not reject the validity of the instruments. Diagnostic tests indicate no evidence of autocorrelation, heteroscedasticity, ARCH or non-normality. Due to using inflation one year ahead and employing lagged interest rates, the actual estimation period ranges from 1999:2 to 2002:5.

³⁰ See R. Clarida et al., op.cit. However, the ECB smoothing parameter is significantly smaller (at a 5% level) than that of the FED in the case of the sample running from 1982:10 onwards (0.97) considered below in equation (5).

of the lagged output gap is significant at a 1% level, expected inflation is significant at a 12% level only. The ECB seems to react similarly to deviations from both the output gap and the inflation rate. We cannot reject the hypothesis that both coefficients are equal.³¹ Thus, a one percentage point drop in the output gap triggers the same response as a one percentage point decrease in the expected inflation rates.

Figure 2 compares the fitted values of equation (2) with actual interest rates. It is apparent that the overall fit is very good ($R^2 = 0.96$), especially at the end of the estimation period.³²

The long-run target interest rate can be computed from equation (2).

$$(3) \text{ target interest rate} = 1.07 + 1.25 \text{ inflation} + 0.85 \text{ output gap}$$

As indicated above, the constant term in (3) is probably too low and statistically insignificant. This may be explained by the fact that the estimation period is characterised by historically unusual low rates of inflation and interest. The relative importance of inflation and output gap remains unchanged by the computation, while the absolute difference has increased. However, the coefficient estimates are still indistinguishable statistically.

It is interesting to compare the estimates in equation (3) with results for the Bundesbank and the US Federal Reserve.³³

Bundesbank (1979:4 to 1993:12)

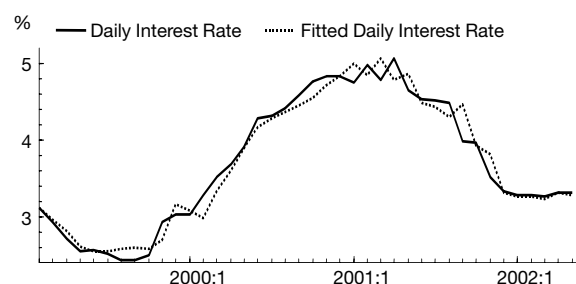
$$(4) \text{ target interest rate} = 3.14 + 1.31 \text{ inflation} + 0.25 \text{ output gap}$$

FED (1982:10 to 1994:12)

$$(5) \text{ target interest rate} = -0.10 + 1.83 \text{ inflation} + 0.56 \text{ output gap}$$

The response to inflation in the estimated ECB reaction function is quite close to the findings for the Bundesbank in equation (4).³⁴ But the output response is more than three times as large in the case of the ECB.³⁵ Thus, while the reaction to price deviations is very similar for the ECB and the Bundesbank, the

Figure 2
Actual and Fitted Daily Interest Rates



ECB appears to put more emphasis on stabilising the output gap.

In the case of the FED, we find a higher coefficient for inflation in equation (5) than that of the ECB estimate. However, this difference is not statistically significant, highlighting the difficulties in estimating a forward looking target precisely.³⁶ The output gap in (5) is lower than the ECB estimate in (3), but only statistically so when applying a significance level of 20%.³⁷

Hence, all in all, the estimates for the ECB are plausible and within the parameter range spanned by studies on other central banks in the literature. One should bear in mind, however, that all of these estimates are surrounded by high uncertainty. For instance, the constant in the US reaction function in (5) has been estimated as being negative, which is not very convincing for a long-run nominal interest rate in equilibrium.

In the introduction, the question was raised whether the current recession in the euro area reflects failures of monetary policy to take stabilisation issues into account. Taking the estimates from equation (3) seriously implies that the ECB puts more emphasis on stabilisation than either the Bundesbank or the FED. Thus, it does not seem very likely that the ECB can be held responsible for the current state of the European economy.

In a next step, the target interest rate is contrasted with the actual daily interest rate (see Figure 3). The correlation coefficient for both series is positive and relatively high (0.55). A closer inspection reveals that for the most part in 1999, actual interest rates are much higher than target interest rates. Then there is some variation of target rates, with two large spikes in December 2000 and November 2001. Regarding the latter, it is remarkable that the monetary easing after

³¹ The test statistic is $F(1,36) = 0.18$.

³² It is interesting to note that the R^2 based on a correlation coefficient between the fitted series and the minimum bid rate is 0.95, thus only slightly smaller.

³³ See R. Clarida et al., op. cit, pp. 1045ff.

³⁴ The difference is also statistically insignificant, the relevant test statistic is $\text{Chi}^2(1) = 0.004$.

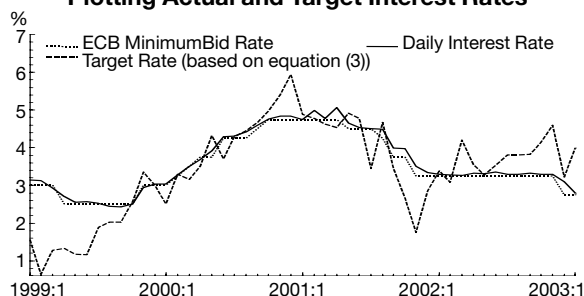
³⁵ The difference is significant at a 1% level, $\text{Chi}^2(1) = 7.03$.

³⁶ The test statistic is $\text{Chi}^2(1) = 0.37$.

³⁷ The test statistic is $\text{Chi}^2(1) = 1.65$.

Figure 3

Plotting Actual and Target Interest Rates



the terrorist attacks on 11 September is fully in line with the target interest rate.

Towards the end of the sample period – from about mid 2002 onwards – there is an upward trend in the target rate, while actual interest rates are going down. Given the lowering of the minimum bid rate to 2% on 5 June 2003, it is likely that the gap between target and actual interest rates will widen further. In conclusion, there is some evidence that monetary policy of the ECB is currently rather loose compared to the target rate.³⁸

Recently, the International Monetary Fund (IMF) expressed some concern that deflation might threaten some EMU member countries, the risk being particularly high for Germany.³⁹ It is feared that conditions similar to those plaguing Japan since the mid 1990s may occur. In Japan, nominal interest rate cuts did not result in lower real interest rates as prices fell even faster. With nominal interest rates finally hitting the lower bound of zero, monetary policy has been unable to provide noticeable positive impulses to the lagging economy. To make matters even worse, in spite of building up huge public deficits, fiscal policy in Japan proved to be rather ineffective in overcoming this situation. Since interest rate decisions in Europe are based on the average of the euro area, monetary policy might be even less suited to prevent rising real rates if deflation occurred in some EMU member countries. In addition, fiscal policy in Europe is restrained due to the adoption of the Stability and Growth Pact.⁴⁰

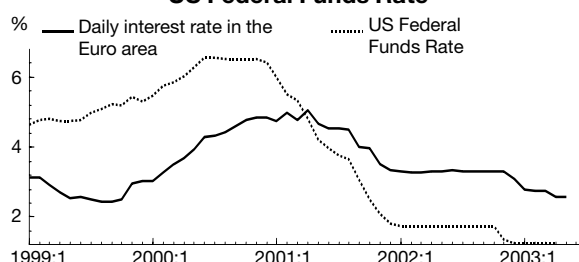
The above analysis using the estimated reaction function for the ECB suggests that interest rates are somewhat too low for the euro area as a whole. Thus,

³⁸ This result has to be interpreted with considerable caution, as the HP-filter used above to generate the output gap does not work well toward the end of the sample period. In other words, the deviation may just reflect problems in constructing the output gap appropriately.

³⁹ International Monetary Fund: Deflation: Determinants, risks and policy options, Washington, 30 April 2003.

Figure 4

Daily Interest Rate in Europe versus US Federal Funds Rate



this is probably going to work against any deflationary tendencies that may play a role in some EMU member countries, such as Germany. In addition, money growth is still very high and it is increasing again (see Figure 1).⁴¹ The annual growth rate rose from 7.9% in March to 8.7% in April 2003. So both the above analysis on interest rates as well as the evolution of monetary developments in the euro area point towards a sufficiently expansionary monetary stance by the ECB, which is very likely going to prevent deflation from becoming a serious issue.

Finally, it has been argued that the ECB is strongly influenced by the US Federal Reserve in its monetary policy decisions.⁴² Figure 4 shows the monthly averages of the daily interest rate in the euro zone together with averages of the US federal funds rate.

Over the relevant time period, the variation of the US interest rate is greater. Moreover, the US rate seems to lead the European rate, at least from about 2000 onwards. Thus it appears that, notwithstanding the official monetary policy strategy or the results of the reaction function estimates presented above, ECB monetary policy is basically determined by decisions taken in Washington.

However, this interpretation does not take into account that similar forces may affect relevant variables in both the USA and the euro area. If the US variables react earlier than their European counterparts, the FED

⁴⁰ The current fiscal situation in some EMU member countries, in particular Germany and France, apparently reflects a deliberate violation of the Stability and Growth Pact. This low regard for the Pact can be interpreted as an indication that it may not exercise a high degree of control on national fiscal policies.

⁴¹ It can be shown that the long-run link between money and inflation is still present after forming EMU; see M.J.M. Neumann: The European Central Bank's first pillar reassessed, mimeo, University of Bonn, 2003.

⁴² See, for instance, H. Herr: ECB Monetary Policy during the "Weak Euro" Period of 1999/2001, in: INTERECONOMICS, Vol. 37, No. 6, 2002, pp. 321-327.

will be moving interest rates first and the Europeans will follow. It will then appear as if the ECB is just adjusting rates as a reaction to FED interest rate moves, although in fact it is reacting to domestic concerns in the euro area. This does not imply that the USA has no impact on ECB decision-making but in this interpretation the influence would be indirect, namely by the US economy's influencing the European economy and thereby European monetary policy.

These competing hypotheses can be tested using the framework of estimated reaction functions utilised above. The federal funds rate is added as an additional exogenous variable to the model presented in equation (1). This is a very conservative test in the sense that if the US interest rate is not important under these circumstances, it is unlikely that it has a large influence. The reason is that the assumption of exogeneity may be wrong, as it might also be the case that the ECB rate influences FED monetary policy decisions. Therefore, if the exogeneity assumption is violated in practice, the coefficient estimate on the US rate will be upward biased.

Equation (6) presents the estimates for the ECB reaction function with the Federal Funds rate added as a regressor.

$$\begin{aligned}
 (6) \text{ interest rate}_t = & -0.23 + 0.21 \text{ inflation}_{t+12} \\
 & (0.35) \quad (0.10) \\
 & + 0.06 \text{ output gap}_{t-1} \\
 & (0.05) \\
 & + 0.90 \text{ interest rate}_{t-1} \\
 & (0.05) \\
 & + 0.04 \text{ US federal funds rate}_t \\
 & (0.02)
 \end{aligned}$$

When comparing equation (6) with equation (2) it is apparent that the coefficient estimates were affected. In particular, the importance of the output gap has gone down while in the case of the inflation variable it has increased.⁴³ The US federal funds rate is significant at the 10% level with a coefficient of 0.04. Thus, if the FED raises interest rates by 50 basis points this month then current European interest rates go up by 2 basis points. Taking the impact of the US rates as statistically significant leads to the conclusion that European interest rates react to US rates but the economic consequences of this linkage are almost trivially small. Since this is the strongest case for the hypothesis that the FED is determining interest rates

in Europe within the framework of reaction functions, it can be concluded that not much evidence is found for the hypothesis that the FED determines monetary policy in Europe.⁴⁴

Although there is evidence that European interest rates follow US rates, this does not automatically imply causation. Analysing the impact of US rates on interest rate setting in the euro area does not provide much support for the hypothesis that the ECB simply follows the FED.

Summary

The following conclusions emerge from the above analysis:

- Both mainstream and alternative interpretations of central bank independence indicate that inflation will not become a major problem in Europe in the foreseeable future.
- The ECB has a very limited degree of public accountability, coupled with a relatively low degree of transparency with respect to policymaking. Whether this is necessarily a bad thing is still subject to research.
- The ECB monetary strategy is not a useful communication device of monetary policy decisions. This conclusion remains true even after the ECB's recent re-assessment of its strategy.
- ECB interest rate decisions can be described using a Taylor rule with the one year ahead inflation rate and the output gap as important variables. The ECB Taylor rule is relatively similar to estimates for the Bundesbank, the Federal Reserve and the Bank of Japan obtained in other studies.
- The ECB puts somewhat more weight on stabilising the output gap than these other central banks do. Thus, the ECB's focus on inflation does not come with the cost of neglecting stabilisation issues. Inflation rate and output gap influence interest rates with approximately the same weight.
- It is not the case that the ECB simply follows the US Federal Reserve. Controlling for domestic considerations within the euro area leaves only a rather small influence for the federal funds rate.

⁴³ Note that the constant is negative. There is now also some evidence for heteroscedasticity.

⁴⁴ The long-run estimates of the coefficients are: target Interest rate = $-2.20 + 1.98 \text{ inflation} + 0.60 \text{ output gap} + 0.35 \text{ US federal funds rate}$. The only significant impact comes from the output gap (p-value: 0.06), while inflation (p-value: 0.18) and federal funds rate (p-value: 0.24) are insignificant.