Is the View from the Eurotower Purely European? – National Divergence and ECB Interest Rate Policy

Friedrich Heinemann and Felix P. Huefner

Centre for European Economic Research (ZEW), Mannheim

October 2002

Abstract

The official view on ECB monetary policy claims that monetary decisions are based solely on average data for the euro zone and that diverging regional developments are disregarded. However, experience from other two tier central banks and theoretical considerations suggest that this official view cannot be accepted without empirical testing. A generalised monetary policy reaction function is developed which allows for an influence of regional divergence. The empirical tests are based on reaction function estimations and a probit model of interest rate decisions for the first years of the euro area. The results offer some first weak support for an impact of regional divergence in ECB decision making. The results further clarify that ignoring a potential national perspective may lead to a serious bias in the estimation of ECB reaction functions. The paper concludes that the correct identification of a possible impact of regional divergence is important for the transparency issue.

JEL-Classification: E 58

Keywords: ECB, monetary policy, Taylor rule

Friedrich Heinemann
P.O. Box 10 34 43
68034 Mannheim
Germany
Phone: + 49 621 1235 149
Fax: + 49 621 1235 223
E-mail: heinemann@zew.de

Felix P. Huefner
P.O. Box 10 34 43
68034 Mannheim
Germany
Phone: + 49 621 1235 144
Fax: + 49 621 1235 223
E-mail: huefner@zew.de

1 Introduction

According to statements of ECB Council members decision making in the Governing Council is based solely on the economic situation of the eurozone as a whole whereas national divergences from the euro area averages are completely ignored. A typical statement of this hypothesis is the following one by Wim Duisenberg: "The members of the Governing Council consider the interests of the euro area as a whole; they do not represent their respective countries" (Duisenberg, 2002b). Furthermore, Council members regularly reiterate the hypothesis that in the Council's discussions only euro area aggregate data play a role and that any national bias is absent in decision making (Duisenberg, 2002a).

It is understandable that Council members communicate decision making of the Council in a way that is consistent with the ECB's mission of maintaining price stability in the euro zone as a whole. What is less obvious, however, is whether this view of Council members as pure European advocates describes the full reality of the way monetary preferences are determined and decisions are taken in the Council. As will be set out below experience with similar two level central banks in the US and Germany hints at the relevance of divergence between aggregate and regional data. Apart from this, doubts about the actual degree of ECB independence and considerations about the role of public opinion in the national governors' utility function back the expectation that the specific national economic situation in a Council member's home country matters for his preferences.

For the understanding of ECB decision making it is essential to know whether there is an impact of divergence in national economic data: The correct identification of the ECB's reaction function is only possible if the relevant weighting of national components for the calculation of euro area aggregates is known. The GDP weighting applied in usual estimates of the reaction function is in line with the ECB's official claim but might not be consistent with the real decision process in the Council. So these estimates could well be misspecified. This misspecification would have serious consequences: Retrospective analyses of ECB decisions would result in biased coefficients for the impact of inflation and growth on interest rate policy. The bias would carry over to any forecast based on this misspecified reaction function.

The issue is also of obvious relevance in the constitutional debate on the future institutional design of the ESCB. If the regional view is indeed relevant the monetary decisions based on the current "one country – one vote" rule would be biased towards the preferences of small countries. A monetary policy non-optimal with regard to the euro area as a whole would be the outcome. This problem would then aggravate after the EMU entry of small Eastern European countries.

With this background, it is the purpose of this paper to test for an impact of national data on ECB decision making in the first years of the euro era. Although the analysis

has its unavoidable limitations given the short euro time span we find anecdotal, descriptive and econometric evidence that national divergence from euro area averages matters in the Governing Council.

We start with a comparative description of the ECB constitution and a literature review (section 2). In section 3, we look at the utility function of ECB Governing Council members where we try to identify possible channels for an impact of regional data. We continue by developing a generalised reaction function allowing for an independent regional impact (section 4). Section 5 presents relevant descriptive data. The empirical centrepiece of our analysis with estimation of a reaction function and an ordered probit is presented in section 5 before we end with some conclusions (section 6).

2 ECB constitution and literature survey

The ECB, like the US Federal Reserve and the former Bundesbank, is a two-tier central bank. Its Governing Council consists of an Executive Board as well as the presidents of the national central banks.

Table 1: Decision-making bodies of ECB, Fed and Bundesbank

European Central Bank		US Federal Reserve Bank		Pre-1999 Bundesbank	
Governing Council		*Federal Open Market Committee (FOMC)*		*Zentralbankrat*	
Executive Board (6 members)	Presidents of the 12 national central banks	Board of Governors (7 members)	5 Reserve Bank presidents*	Direktorium (8 members)	Presidents of the 9 regional "Landeszentralbanken"
∑ 18 votes		∑ 12 votes		∑ 17 votes	
$\frac{regional\ votes}{central\ votes} = 2$		$\frac{regional\ votes}{central\ votes} = 0.71$		$\frac{regional\ votes}{central\ votes} = 1.13$	

*Rotation out of 11 regional federal reserve districts with a permanent seat of the Federal Reserve Bank of New York.

However, in difference to the US central bank, all presidents of the national European central banks have permanent seats in the Governing Council. Consequently, the regional aspects are relatively more pronounced in the ECB Governing Council, i.e. the regions have relatively more voting power than the centres (see also Berger and de Haan, 2002): while the ratio of regional votes per centre votes is 0.71 for the Federal Reserve and 1.13 for the Bundesbank, the corresponding ratio for the ECB is 2.

The influence of regional votes on the interest rate decisions of central banks has attracted some interest in the economic literature recently. Aksoy et al. (2002)

present an analysis how different decision making procedures would affect welfare. They find that a euro-wide perspective is advantageous compared to a "nationalistic" view in the ECB's Governing Council. However, this study does not comment on the empirical relevance of these different views.

In this sense, Meade and Sheats (2002) are closer to our approach. They focus on US monetary policy and analyse the voting records of the monetary policy committee. More precisely they estimate whether regional factors influence the probability of a voter in the committee to dissent from the majority vote. Their findings indicate that regional unemployment developments significantly influence the decisions of the committee voters to dissent. Interestingly, the importance of variables of the voters' regional background was found to be more important for board members located in the Washington, D.C. main office than for the regional Bank presidents.

Berger and de Haan (2002) concentrate on voting behaviour in the Governing Council (Zentralbankrat) of the former Bundesbank. They find that both inflation differences and differences in real growth significantly influenced dissenting voting behaviour, thereby supporting the findings of Meade and Sheats (2002) for the Fed.

Both Meade and Sheats (2002) as well as Berger and de Haan (2002) interpret their findings with reference to the ECB. The former look at the distribution of inflation rates across EMU countries in months prior to ECB decisions and find that the direction of the interest rate change was compatible with the number of countries that had inflation rates above or below the EMU inflation. The latter present stylised facts about different preferences of voting members in the ECB Governing Council (measures of conservativeness or political background) and also about diverging economic developments in the eurozone.

While their analysis leads to first results they do not present hard evidence. Meade and Sheats (2002) focus only on interest rate decisions of the ECB rather than analysing whether their theory of regional influences is also able to explain ECB behaviour in months without a change in interest rates.

Faust et al. (2001) provide a first attempt to uncover the monetary policy rule of the ECB. In order to deal with the short time series available for ECB policy they estimate a reaction function for the Bundesbank and simulate a potential path for the ECB period using the estimated coefficients. They find that the actual ECB interest rate is actually significantly below the fitted values of the Bundesbank benchmark function. The authors try to explain the discrepancy with a voting scenario in the Governing Council where Germany and France would dominate the decision making. However, even using this extreme assumption does not account for the difference of ECB and potential Bundesbank interest rates. They also simulate individual interest rates across EMU countries using a Taylor rule with estimated

coefficients for the Bundesbank and national data. In this way they show large discrepancies across EMU countries. For example, the fitted interest rate for Ireland was on average over six percentage points higher than the actual ECB interest rate.

3 ECB Council members and national divergence

The existing literature does rarely become explicit about what could be the institutional and political-economic basis for national preferences of ECB's Governing Council members. We see different arguments. The first argument is closely connected to the debate on the actual degree of policy independence of Council members. If this independence is not perfect as authors like Vaubel (2002) argue there is an immediate case for a regional bias in ECB decision making. The literature on vote and popularity functions has established that national economic data are of major importance for the reelection chances of incumbent governments. The most important variables in this context are national unemployment, growth and inflation (for a recent survey see Lewis-Beck and Paldam, 2000). Hence, if national governments have any influence on their country's members in the Governing Council, this influence would clearly open a channel for a regional bias in ECB decision making.

However, imperfect independence of ECB is not a necessary condition for an impact of regional divergence. It might well be the case that members of the Governing Council are particularly interested in the economic situation of their home country even if they are indeed fully independent from national politics. It is plausible to assume that public opinion on the performance of ECB policy matters in the utility function of these individuals. In this context it is crucial to recognise important characteristics of "European" public opinion: A pan-European public in the sense of pan-European newspapers or television programmes does practically not exist. Furthermore, national central bank governors are in the spotlight of their home country's and not other countries' media. For instance, statements of governors from Greece, Ireland or the Netherlands are hardly ever quoted in German newspapers or television, while the president of Deutsche Bundesbank is a prominent person with frequent coverage of his views in German media. These considerations suggest that national public opinion about the ECB in the home country should matter much more for a national central bank president than the "average" of public opinions in eurozone countries. If the Irish or Dutch public is very concerned with a high inflation rate this would not be without consequences for the evaluation of the Irish or Dutch central bank president in the media of the specific country.

Of course, it is difficult to find direct evidence for these suggestions. Generally, the members of the Governing Council adhere to the official rhetoric about the sole importance of euro averages for monetary decisions. But some examples might be helpful to illustrate the possible impact of the national situation: Ireland, for

example, has been an EMU member country characterised by above average inflation rates in the first years of the euro so that, from the Irish perspective, monetary policy has been too expansionary. Faced with this problem in the Irish media, the following quote of governor Maurice O'Connel in the Irish Independent is interesting:

"It's no secret that we would prefer higher interest rates," adding that apart from being the fastest growth economy in the eurozone, Ireland also has the third highest inflation rate. However, he went on to state that Ireland "must conform with what is good for the euro area."
(Irish Independent, May 9, 2001)

Also revealing is a report concerning the Dutch governor, Nout Wellink, coming also from a country with an above average inflation rate in the first years of the euro:

"It is correct that big countries have the tendency to vote according to their own interests" Wellink said ... He stated that there were often disagreements among the six members of the ECB Executive Board.
(Frankfurter Allgemeine Zeitung, June 15, 2002, translated by the authors)

In addition, small countries' national representatives in the Governing Council are well aware of the fact that they have a voting power that is relatively large compared to their GDP share. Klaus Liebscher, the president of the Austrian national bank revealed this awareness in the following statement (this statement occurred before the EMU start and thus before the Governing Council members have been trained to adjust their terminology to the official view):

"As a smaller central bank, we have many opportunities ahead of us, being on the ECB board where there is one person, one vote," he said. "We will be able to influence monetary policy in ways we could not until now."
(The European, July 6, 1998)

So there is at least anecdotal evidence that there are national views in the Governing Council and that these national views might even be present within the Executive Board (see the Wellink quote).

Wim Duisenberg regularly reports in his press conferences subsequent to Governing Council sessions that decisions had been reached without a formal vote. It must be stressed that the absence of a formal vote (if true) is no evidence in favour of an actual consensus of monetary views. If the discussion reveals each member's preferences a formal vote becomes redundant. Members of the Council who infer from the debate that they belong to a minority should not be interested to make their defeat formal in an explicit vote.

Summing up, it seems reasonable to empirically test the hypothesis of a regional bias in ECB decision making.

4 A generalised reaction function of a two-tier central bank

The preceding arguments can now be translated into a generalisation of standard monetary reactions functions. Usually a reaction function is formulated for a central bank's Governing Council as a whole on the basis of aggregate data for the relevant currency area. The typical example includes the well-known Taylor rule as in Taylor (1993):

(1) $$i^* = r^* + \pi + 0.5\,(\pi - \pi^*) + 0.5\,gap$$

or equivalently

(1)' $$i^* = \alpha + \beta\,\pi + \gamma\,gap \qquad \text{with} \quad \alpha = r^* - 0.5\pi^*,\ \beta = 1.5 \text{ and } \gamma = 0.5\,.$$

where i^* denotes the preferred short-term nominal interest rate, r^* the neutral real interest rate. π and gap stand for inflation and output gap where π^* is the target inflation rate. The parameters 1.5 and 0.5 are not essential to the rule – they merely represent Taylor's findings for the US and therefore might vary for other countries. The intuition of the Taylor rule is straightforward: given an equilibrium nominal short term interest rate, consisting of the real interest rate plus the target inflation rate, short term interest rates need to be higher whenever actual inflation is above the target or if output is above potential output (which is equal to a positive value for the output gap).

A straightforward estimation of (1)' for the ECB on the basis of eurozone aggregate data would be problematic given our above considerations regarding the two-tier ESCB constitution. This would be an undue simplification of the aggregation process linking individual monetary preferences in the Governing Council with its collective decisions. Therefore, we develop a more general framework not excluding a priori a possible independent impact of national data.

Equation (2) represents the individual reaction function of the Taylor type for Council member *j*. The standard Taylor equation (1)' is augmented by additional terms reflecting a possible impact of divergence in the Council member countries. Apart from the European aggregates (superscript *E*) national aggregates (superscript *N*) are included.

(2) $$i^*_{t,j} = \alpha_j + \beta_{E,j}\pi^E_t + \beta_{N,j}(\pi^j_t - \pi^E_t) + \gamma_{E,j}gap^E_t + \gamma_{N,j}(gap^j_t - gap^E_t)$$

In this general specification there are two sources for different target interest rates (see also Meade and Sheets, 2002): Either coefficients in (2) are not identical among Council members and/or there is divergence in national data. Differences in coefficients might result from differences in the national transmission mechanisms or in inflation and output preferences.

For the sake of the exposition's clarity let us now assume homogeneity of the reaction functions' coefficients among Council members: In this case (2) simplifies to (2)':

(2)' $$i^*_{t,j} = \alpha + \beta_E \pi^E_t + \beta_N (\pi^j_t - \pi^E_t) + \gamma_E gap^E_t + \gamma_N (gap^j_t - gap^E_t)$$

or equivalently

(2)'' $$i^*_{t,j} = \alpha + (\beta_E - \beta_N)\pi^E_t + \beta_N \pi^j_t + (\gamma_E - \gamma_N) gap^E_t + \gamma_N gap^j_t$$

We can now make a distinction between two polar cases for the decision making in the Council:

The official hypothesis is that Council members completely ignore the regional data and solely concentrate on the euro area aggregates. We call this the "*euro area advocates hypothesis*"; in this case the divergence of national from European data would simply drop from the reaction function:

(3) *Euro area advocates:* $\beta_N = \gamma_N = 0$

$$\Rightarrow \quad i^*_{t,j} = \alpha + \beta_E \pi^E_t + \gamma_E gap^E_t$$

The exact opposite is the "*pure national advocates hypothesis*" where Council members only look at national data; in this case we would end up with an individual conventional reaction function where the national inflation rate and output gap would replace the European aggregate:

(4) *Pure national advocates hypothesis:* $\beta_E = \beta_N = \beta,\ \gamma_E = \gamma_N = \gamma$

$$\Rightarrow \quad i^*_{t,j} = \alpha + \beta\ \pi^j_t + \gamma\ gap^j_t$$

The general formulation of (2)' can thus be understood as an intermediate case where Council members look at European aggregates but in addition take also account of the particular development in the home country (note the coefficient restriction $\beta_E \geq \beta_N$ and $\gamma_E \geq \gamma_N$, becoming obvious from (2)'').

The different cases would also translate into different aggregate Council reaction functions. Under the euro area advocates hypothesis this translation is straightforward: Since each Council member's reaction function is identical to equation (3), this represents at the same time the ECB's reaction function.

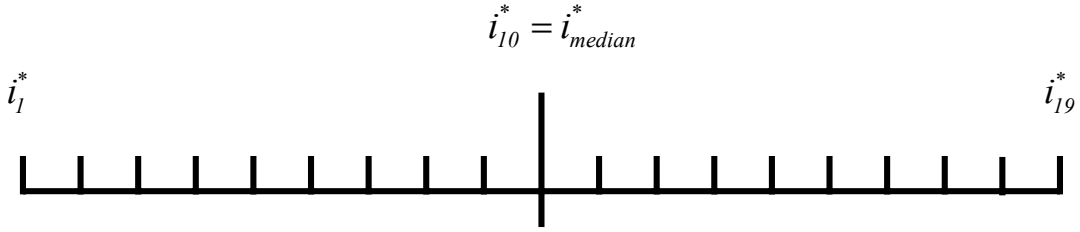
$$(5) \qquad i^*_{t,ECB} = \alpha + \beta_E \pi^E_t + \gamma_E gap^E_t$$

The reaction function in (5) corresponds to the world depicted by Wim Duisenberg in his statements cited in the introduction: there is consensus and regional developments do not matter.

The aggregation of individual preferences is more complex, however, if assumption (3) does not hold. Depending on their national situation Governing Council members will prefer different interest rate levels. The preferred median interest rate would be the outcome of majority voting both for the pure national advocates hypothesis and intermediate cases.

Given its present composition with 12 national governors, 6 board members and the president's double vote in split decisions, the median is the tenth position out of 19 ordered interest rate preferences, counting the presidents preference twice.[1]

Figure 1: The median voter theorem in ECB decisions



Note: $i^*_1 < i^*_1 < ... < i^*_{19}$.

Thus, the more general ECB reaction function which does not exclude a priori the independent impact of regional data is:

[1] See Treaty on the European Union, Protocol no.3, Article 10, chapter 3: "...each member of the Governing Council shall have one vote. Save as otherwise provided for in this Statute, the Governing Council shall act by a simple majority. In the event of a tie the President shall have the casting vote." As the median voter theorem always assumes a stalemate, the president's vote is double-weighted in all cases.

(6) $$i^*_{t,ECB} = median\ (i^*_{t,1} i^*_{t,2}, ..., i^*_{t,19}) =$$

$$\alpha + \beta_E \pi^E_t + \beta_N (\pi^{j=median}_t - \pi^E_t) + \gamma_E gap^E_t + \gamma_N (gap^{j=median}_t - gap^E_t)$$

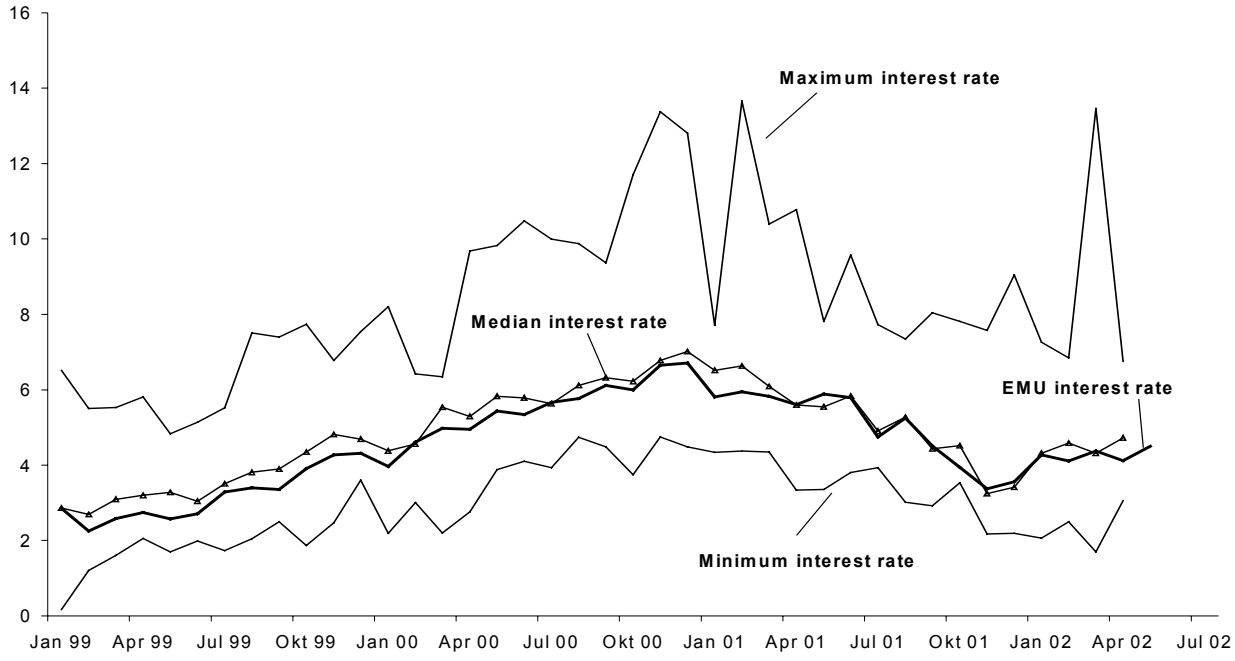
Note that $\pi^{j=median}_t$ and $gap^{j=median}_t$ do not stand for the *median* inflation rate and output gap but for the *median's* inflation rate and output gap. The median's inflation rate (output gap) might be different from the median inflation rate (output gap).

It must be stressed that this formulation and the following empirical tests are based on the simplifying assumption that the reaction function's coefficients are homogeneous among Council members. A more general formulation would, therefore, even allow for individual coefficients α, β and γ as in equation (2).

5 Descriptive analysis

To illustrate the potential empirical relevance of the national voting argument, we calculated for each country as well as for the euro area a simple Taylor rule assuming for all countries a real interest rate level of 2.5 percent, an inflation target of two percent and an equal weight of 0.5 for both the inflation deviation and the output gap. Figure 2 shows the resulting maximum, minimum and median interest rates compared with the interest rate calculated for the euro area as a whole.

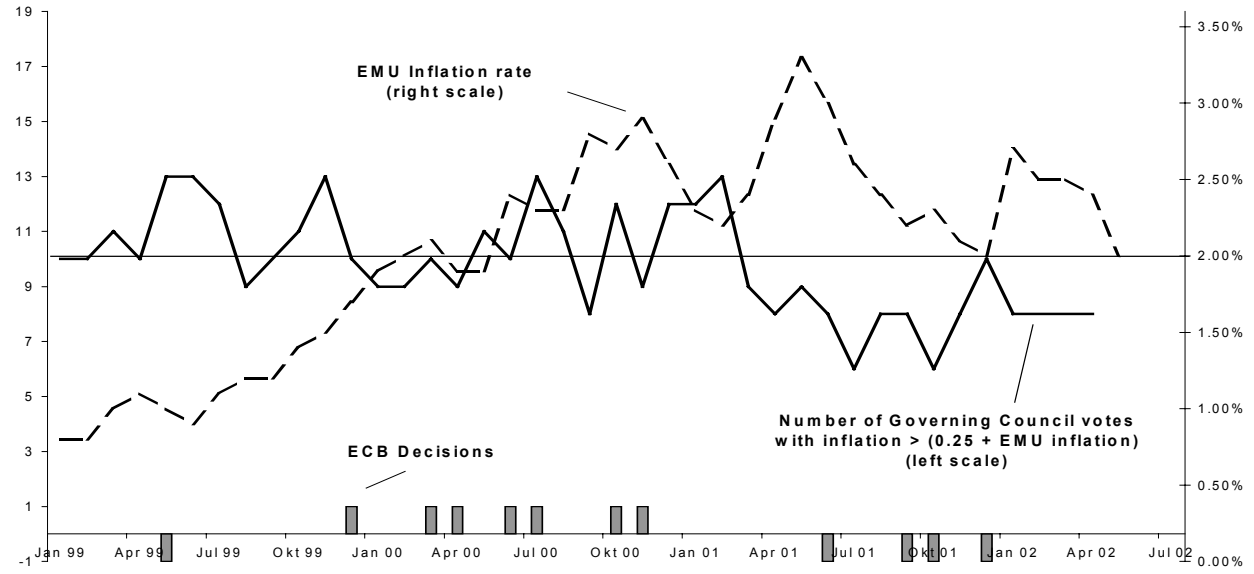
Figure 2: Taylor interest rates



Note: Left scale in percent. Interest rates were calculated with a Taylor rule of the form $i^* = 2.5 + \pi + 0.5(\pi - 2) + 0.5 gap$. Source: Thomson Financial Datastream (see appendix for details), own calculations.

This simple calculation shows the divergence of interest rates across the euro area resulting solely from differences in the national inflation and output variables. While a higher interest rate might have been appropriate for Ireland given its booming economy and inflation rates, a more moderate policy stance would at times have been required for the French economy. In 2001, for example, Ireland exhibited GDP growth of 5.9 percent and an inflation rate of 4.9 percent, while France had GDP growth of 1.8 percent combined with an inflation rate of 1.6 percent. The continuous difference between maximum and minimum interest rates highlights these facts and gives rise to the suspicion that there have been considerable disagreements in the Governing Council with regard to interest rate decisions. However, Figure 2 also shows that the median interest rate moves quite closely with the interest rate calculated for the euro area. Thus, although there are large divergences in the national data, the median voter would have preferred a policy stance close to what a Taylor rule would have recommended for the euro area as a whole. Naturally, this limits the analysis of the influence of a regional bias in ECB decision making due to only few discrepancies between both series.

Figure 3: Majority distributions, EMU inflation and interest rate decisions



Note: The ECB decisions are displayed as a –1/0/1-variable, i.e. +1 signifies an interest rate increase, –1 resembles a decrease and 0 defines a decision to leave interest rates constant. Source: Thomson Financial Datastream (see appendix for details), own calculations.

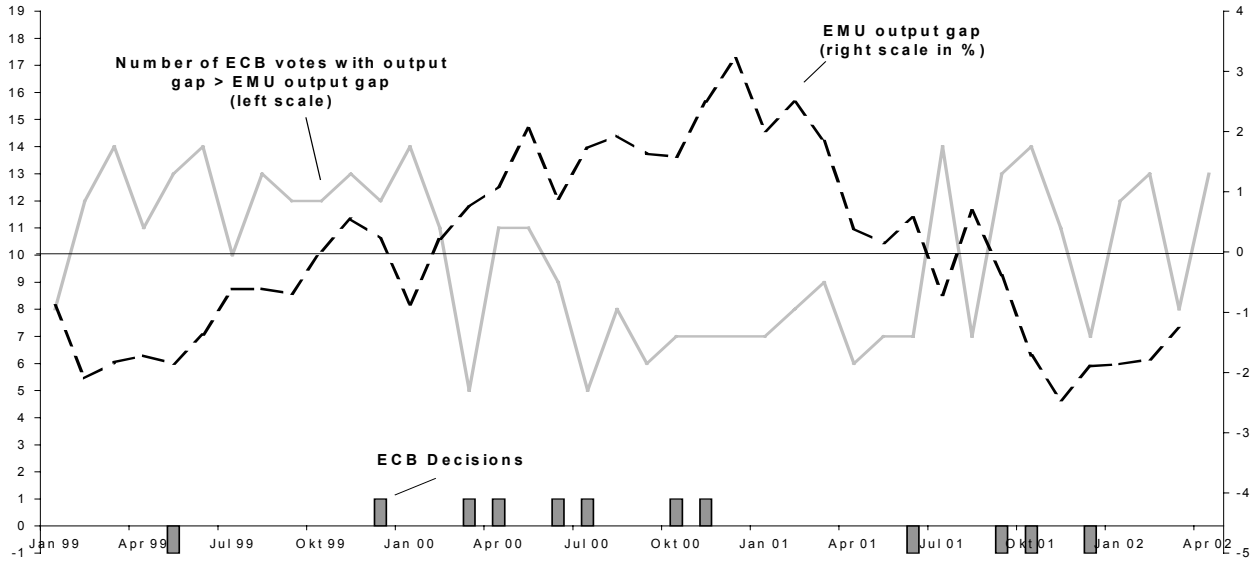
Now consider the likely path of voting majorities in the Council. Figure 3 displays the number of votes in the Governing Council for those countries that have inflation rates above the euro area average plus 0.25 percentage points.[2] As the president's vote has a double-weighting in a stalemate, the total number of votes is 18 before the

[2] As Meade and Sheats (2002) we assume that Council members are likely to vote in a particular fashion only if their inflation rate differs from the euro average by a threshold of at least 0.25.

accession of Greece and 19 thereafter (11 (12 with Greece) national governors and six votes of the members of the Executive Board with a double-weighting of the president's vote). Also displayed are the EMU inflation rate and whether the ECB decided to increase, decrease or leave interest rates unchanged.

The solid straight line indicates whether there is a majority of votes that are likely to vote for interest rate increases (since their inflation rates are above the EMU weighted average) and at the same time shows if EMU inflation is above the two-percent ceiling which defines the as defined by the ECB. While the first interest rate decrease in May 1999 as well as the subsequent series of interest rate increases starting in December 1999 can well be justified with EMU inflation being below and above the two-percent ceiling, it is more difficult to make sense of the period of interest rate decreases that began in 2001 (where eurozone inflation remained clearly above the two-percent ceiling). One possible explanation (apart from output considerations and the exceptional circumstances surrounding September 2001) stems from the majority distribution of votes in the Council. The number of votes with inflation rates above the EMU inflation fell below 10 in early 2001 and thus it can be argued that with more countries having lower inflation rates there was a propensity in the Council towards lowering rates – even though EMU inflation remained above the two-percent ceiling.

Figure 4: Majority distributions, EMU output gap and interest rate decisions



Note: The ECB decisions are displayed as a –1/0/1-variable, i.e. +1 signifies an interest rate increase, –1 resembles a decrease and 0 defines a decision to leave interest rates constant. Source: Thomson Financial Datastream (see appendix for details), own calculations.

Figure 4 displays the majority distributions in the Governing Council concerning the output gap compared with the EMU wide weighted average. Visual inspection suggests that interest rate decisions are more in line with the EMU wide output gap

(i.e. interest rate increases (decreases) whenever there is a positive (negative) output gap) than with the majority distributions in the Council. During the year 2000, for example, EMU wide output gap was positive and interest rates were increased although the majority of Council members represented countries with a worse economic performance than the EMU average.

6 Econometric evidence

In contrast to studies about decision making at the Federal Reserve, we do not have information about the voting behaviour of individual Council members due to the lack of policy meeting minutes. As a consequence, we cannot identify specific reaction functions of individual Council members (of the equation (2) type in section 4). Instead we have to rely on indirect conclusions from estimation of the aggregate ECB reaction function (of the equation (6) type in section 4). Thus, the main idea of our approach is to test whether reaction function specifications that make use of the distance between median inflation/output gap and euro area average inflation/output gap can be supported.

We are applying two different empirical approaches: we first estimate modified Taylor rules directly corresponding to the generalisation presented in chapter 4 and second estimate a probit model with the interest rate decisions as a discrete variable. The justification for different approaches originates from the rather short time span available for the operation of the ECB. This means that results must be interpreted with care and the use of different approaches serves as a measure of robustness of our results.

6.1 Data and specifications

The sample period we use starts in January 1999 and ends in April 2002 and includes monthly data. As a proxy for economic activity we use industrial production, which unlike GDP figures is available on a monthly basis. In order to create output gaps that enter the monetary policy rule we use a Hodrick-Prescott Filter to construct a measure for potential output (smoothing parameter 14.400). Inflation is measured using the Harmonised Index of Consumer Prices (HICP) for the euro area and the Harmonised Consumer Prices for each country (see appendix for a list of data sources for each country). The interest rate used is the euro overnight rate (Eonia) obtained from the ECB. Until the EMU entry of Greece in January 2000 the median of the national variables was calculated on the basis of 18 national votes, thereafter on the basis of 19 votes. The country composition of the Executive Board was unchanged during our sample period (the post of vice-president was changed from France to Greece in June 2002).

Both the estimations of Taylor rules and probit models are based on three specifications according to our differentiation in section 4. The *euro advocate* specification corresponds to equation (3) and the official view that all members of the Governing Council base their decision solely on GDP weighted eurozone average data. The *pure national advocate* specification stands for equation (4) and the other extreme where Council member solely look at data of their home country. The *intermediate rule* specification assumes according to equation (2)'' that in addition to euro averages Council members also take account of the situation at home.

A further variant that might be theoretical interesting turned out to be empirically redundant: treating the members of the Executive Board as euro advocates (their preference associated with euro area average data) and the national governors as national advocates. This modification is empirically equivalent to the euro advocate view since, in this set-up, the median is always a board member with his preference based on euro averages.

Compared to the theoretical exposition in section 4 the empirical approach must simplify in regard to the above equation (6). Since it is not possible to identify each Council member's individual preferences it is also not possible to identify the median voter in the Council. The pragmatic solution we apply is to use not the median's but the median inflation rate and output gap.

6.2 Reaction function

In empirical research the original Taylor rule of the form $i_t=\alpha+\beta\pi_t+\gamma gap_t+\varepsilon_t$ is usually modified to include the lagged short-term interest rate in order to model interest rate smoothing: $i_t=\rho i_{t-1}+(1-\rho)[\alpha+\beta\pi_t+\gamma gap_t]+\varepsilon_t$ with ρ as the smoothing term. If a central bank indeed pursues interest rate smoothing this means in practice that it adjusts gradually to the interest rate prescribed by the policy rule. More refined studies on Taylor rule estimate forward-looking versions of a Taylor rule (see e.g. Clarida et al., 1998). While this would without doubt be appropriate for the ECB, too, the short time span limits the ability to use more sophisticated estimation methods to account for forward-looking behaviour. Thus, we restrict our analysis to the case where the central bank reacts to contemporaneous inflation and output. Inflation rates enter the reaction function with a lag of one month and output gaps with a lag of two months to take account of the publication lags of both variables in reality.[3] We use traditional OLS analysis for the estimation.

[3] Inflation rates have usually a shorter publication lag (about one month) than figures for industrial production (about two months), hence the different lag structure.

Table 2: Estimation results for policy reaction function

	Euro Area Advocates		*Intermediate Rule*		*Pure National Advocates*	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
i^*_{t-1}	0.66***	0.06	0.69***	0.08	0.69***	0.07
π^E_{t-1}	0.20***	0.06	0.24**	0.10		
gap^E_{t-2}	0.12***	0.03	0.13***	0.03		
π^{median}_{t-1}					0.24**	0.09
gap^{median}_{t-2}					0.13***	0.03
$(\pi^{median}_{t-1} - \pi^E_{t-1})$			0.21	0.22		
$(gap^{median}_{t-2} - gap^E_{t-2})$			0.13	0.08		
Long-run inflation elasticity 1	0.59		0.77		0.77	
Long-run output gap elasticity 1	0.35		0.42		0.42	
Adj. R^2	0.93		0.93		0.93	
Observations	40		39		39	

Notes: Sample range Jan. 1999 – Apr. 2002. Reported standard errors are Newey-West adjusted. Significance levels: *, **, *** (10%, 5%, 1%). [1]Long-run inflation and output elasticity is calculated as $\beta/(1-\rho)$ and $\gamma/(1-\rho)$.

The estimation of the *euro area advocates* is equal to the ordinary Taylor rules that are already estimated in some studies. Apart from the smoothing term, both the inflation and the output gap variable enter the equation with highly significant positive coefficients. Thus, the ECB increases (decreases) its repo rate whenever inflation or the output gap increase (decrease).

Regarding our second specification, the *intermediate rule*, it can be seen that both regional factor terms have positive coefficients – as expected – but are clearly insignificant.

In the "*pure national advocates*"-specification again all variables are significant and have the correct sign. In contrast to the first specification, however, there is a higher sensitivity both to inflation and the output gap with long-run elasticities of 0.77 and 0.42 compared with 0.59 and 0.35.

These regressions do not allow to distinguish whether the euro area or the national view is empirically more relevant. Both polar assumptions produce regressions with similar explanatory power. Nevertheless, the different results for the long-run elasticities underline that there is a severe problem of identification as long as the question concerning a national impact cannot be answered into the one or other direction. The different coefficients of the *euro advocate* and the *pure national advocate* specification indicate the direction of the possible bias: If the national advocate assumption is true regressions based on the official view produce inflation and output gap coefficients that are biased downwards.

However, these results have to be interpreted with a fair amount of caution as the sample period is rather short and the median variables often are not very different from the EMU average (more precisely, the median inflation rate is above the EMU average most of the time).

6.3 An Ordered Probit Estimation Approach

The above estimated Taylor rule models the short-term interest rate as a continuously changing variable. In reality, however, the ECB, just like the Federal Reserve, adjusts its repo rate in multiples of 25 basis points. Thus, it is possible to construct a discrete variable that indicates whether the policy instrument was increased, decreased or left unchanged. While the ECB constantly performs open market operations that have an influence on the continuous interest rate, the discrete changes in the repo rate are the result of voting decisions in the Governing Council every fortnight. The ordered probit therefore presents additional information about the variables that influence voting decisions. The dependent variable of our probit specification takes the value of –1 (1) for months in which the ECB lowered (increased) its repo rate and 0 for months in which the repo rate has been left unchanged.[4] As explanatory variables we use the same as for the Taylor rule estimation in the previous chapter. Table 3 displays the coefficient estimates for our three specifications.

[4] Unlike Dueker (1999) we do not differentiate between the extent of increase or decrease because of lack of data. Note that our sample does not contain months with multiple interest rate decisions, hence the construction of a monthly discrete variable seems appropriate. See appendix for an overview of ECB interest rate changes. See Greene (2000), chapter 19 for an illustration of the ordered probit model.

Table 3: Coefficient estimates for ordered probit

	Euro Area Advocates		*Intermediate Rule*		*Pure National Advocates*	
	Coef.	Std. Error	Coef.	Std. Error	Coef.	Std. Error
i^{*}_{t-1}	-2.33***	0.75	-2.66***	0.90	-2.63***	0.80
π^{E}_{t-1}	1.37**	0.65	2.35***	0.85		
gap^{E}_{t-2}	0.95***	0.28	1.24***	0.42		
π^{median}_{t-1}					1.27***	0.39
gap^{median}_{t-2}					2.24***	0.82
$(\pi^{median}_{t-1} - \pi^{E}_{t-1})$			3.77*	1.96		
$(gap^{median}_{t-2} - gap^{E}_{t-2})$			1.23*	0.65		
γ_1	-7.53***		-6.20**		-6.59***	
γ_2	-4.57***		-2.35		-2.92**	
Pseudo R^2	0.25		0.37		0.36	
Observations	40		39		39	

Notes: Sample range Jan. 1999 – Apr. 2002; Significance levels: *, **, *** (10%, 5%, 1%).

As in the previous Taylor rule estimation, all three variables (lagged interest rate, inflation rate and output gap) exhibit highly significant coefficients in the first specification. The lagged interest rate enters the equation with a negative sign, indicating that a higher interest rate in the previous month decreases the probability of an interest rate increase this month (and increases the probability of an interest rate decline). As expected, both coefficients for the inflation rate and the output gap are positive, indicating an increased probability of an interest rate increase the higher both variables are.

Regarding the *intermediate rule*, both regional factors are significant at the ten percent level with the correct signs. Thus, according to the probit estimation the hypothesis of a regional influence is weakly supported for the intermediate specification. This stands in contrast to the results for the Taylor rule. A further support for the impact of regional divergence comes from the *pure national advocates* regression which compared to the *euro area advocate* regression is characterised by a larger explanatory power.

Table 4 displays the marginal effects for each variable and specification, i.e. the change in the probability of each category for a one unit (i.e. percentage point)

change in the explanatory variable calculated for mean values of explanatory variables. This allows us to interpret and compare the impact that a small change of each variable has on the voting decision.

Table 4: Marginal effects

	Euro Area Advocates			*Intermediate Rule*			*Pure National Advocates*		
	Prob(y=...)			Prob(y=...)			Prob(y=...)		
	-1	0	1	-1	0	1	-1	0	1
i^*_{t-1}	0.25	0.13	-0.38	0.13	0.09	-0.21	0.14	0.13	-0.27
π^E_{t-1}	-0.15	-0.08	0.22	-0.11	-0.08	0.19			
gap^E_{t-2}	-0.1	-0.05	0.16	-0.06	-0.04	0.1			
π^{median}_{t-1}							-0.12	-0.11	0.23
gap^{median}_{t-2}							-0.07	-0.06	0.13
$(\pi^{median}_{t-1} - \pi^E_{t-1})$				-0.18	-0.13	0.3			
$(gap^{median}_{t-2} - gap^E_{t-2})$				-0.06	-0.04	0.1			

Note: The marginal effects in each category sum to zero (see Greene (2000), p.878).

A rise in the eurozone inflation rate by one percentage point increases the probability for a tightening of monetary policy by 0.22. The same result applies to an increase in the median inflation rate with a marginal effect of 0.23. However, the probability of a rate rise is increased by 0.3 if the difference between the eurozone and the median inflation rate increases. This shows that the neglect of the regional dimension can lead to an underestimation of the probability of an interest rate increase decision of the ECB Council. The same applies to the output gap with a marginal effect of 0.1 for the divergence between median and eurozone data. However, the impact of a regional dimension seems to be quantitatively more important for inflation rates than for output gaps.

7 Conclusions

Our descriptive and anecdotal analyses have produced some weak evidence for an impact of regional divergence in ECB decision making. The econometric analyses have led to two important results concerning the impact of national data:

First, while we were not able to clearly state whether a *euro advocate* or a *pure national* view dominates the voting in the ECB Council, our results contained different coefficients for both specifications. Thus, conventional Taylor rules that rely solely on eurozone variables might be biased. Second, however, according to

the results of the ordered probit we found weak evidence for the hypothesis that ECB Council members take into account divergences of national data from eurozone averages. The results also suggest that the impact of regional data is more pronounced for inflation than for output considerations (this is also supported by the descriptive analysis).

Of course, the analysis suffers from some limitations: the most important one results from the short time span of data for the era of ECB responsibility. This short time span also explains why more sophisticated specifications for the reaction function like forward looking estimations cannot yet be applied.

Even though time will bring more observations this will not overcome all identification problems. As long as observers have no further insights into ECB Council decision making this will preclude a definite conclusion on the relevance of regional divergence and different national monetary preferences in the Council. There are many good arguments in favour and against the publication of minutes from ECB Council sessions. Our considerations, however, show that such a better view into the 'black box' ECB Council would help ECB observers to find a more reliable specification for modelling ECB decision making. This would make monetary policy more predictable.

Our results also stress the importance of the ongoing debate on the optimum ESCB constitution after enlargement. Heterogeneity in economic structure, development and monetary preferences is likely to increase considerably with the EMU entry of small and medium sized countries from Eastern Europe. If for EMU-12 there is some evidence that divergence is not irrelevant in the Governing Council this should be even more pronounced for EMU-27. In this sense our first results back the case for adjusting the representation and/or voting weights in the Governing Council in favour of the countries with large GDP shares.

References

Aksoy, Y., P. De Grauwe and H. Dewachter (2002), Do asymmetries matter for European monetary policy? *European Economic Review* 46, 443-469.

Berger, H. and J. De Haan (2002), Are Small Countries too Powerful Within the ECB?, *Atlantic Economic Journal*, forthcoming.

Clarida, R., J. Gali and M. Gertler (1998), Monetary Policy Rules in Practice: Some International Evidence, *European Economic Review* 42, 1033-1067.

Dueker, M. (1999), Measuring Monetary Policy Inertia in Target Fund Rate Changes, *Federal Reserve Bank of St. Louis Review*, September/October, 3-9.

Duisenberg, W. (2002a), Challenges to the ECB's monetary policy, Speech by Dr. Willem F. Duisenberg, President of the European Central Bank, upon receiving the European Banker of the Year Award on behalf of the Governing Council of the ECB, Frankfurt, 16 May, www.ecb.int.

Duisenberg, W. (2002b), Some remarks on the euro in a US context, Speech by Dr. Willem F. Duisenberg, President of the European Central Bank, at a breakfast meeting of the Council on Foreign Relations, New York, 19 April, www.ecb.int.

Faust, J., J.H. Rogers and J.H. Wright (2001*), An Empirical Comparison of Bundesbank and ECB Monetary Policy Rules*, International Finance Discussion Papers no.705, Board of Governors of the Federal Reserve System.

Greene, W.H. (2000), *Econometric Analysis*, 4th edition, Hall, New Jersey.

Lewis-Beck, M.S. and M. Paldam (2000), Economic voting: an introduction, in: *Electoral Studies* 19, 113-121.

Meade, E.E. and D.N. Sheets (2002), *Regional Influences on U.S. Monetary Policy: Some Implications for Europe*, International Finance Discussion Papers no. 721, Board of Governors of the Federal Reserve System.

Taylor, J.B. (1993), Discretion Versus Policy Rules in Practice, *Carnegie-Rochester Conference Series on Public Policy* 39(0), 195-214.

Vaubel, R. (2002), *The Future of the Euro: A Public Choice Perspective*, Mannheim.

Data Appendix

1. Data source

Country	*Inflation rates*	*Industrial production*
Austria	IMF (OEI64H..F)	OECD (OEOPR035G)
Belgium	IMF (BGI64H..F)	I.N.S.E.E. [1] (BGIP7500G)
EMU	Eurostat (EMESHARM%)	OECD (EMOPR035G)
Finland	IMF (FNI64H..F)	IMF (FNI66..IG)
France	IMF (FRI64H..F)	IMF (FRI66..IG)
Germany	IMF (BDI64H..F)	OECD (BDOPR035G)
Greece	IMF (GRI64H..F)	OECD (GROPR035G)
Ireland	CSO[3] (IRCPIEU.F)	OECD (IROPR035G)
Italy	IMF (ITI64H..F)	ISTAT[2] (ITINPRODG)
Luxembourg	IMF (LXI64H..F)	OECD (LXOPR035G)
Portugal	OECD (PTOCP049F)	OECD (PTOPR035G)
Spain	IMF (ESI64H..F)	IMF (ESI66..IG)
The Netherlands	IMF (NLI64H..F)	IMF (NLI66..IG)

Notes: Datastream Mnemonics in parentheses. [1] Institut National de la Statistique et des Études, France, [2] Instituto Nazionale di Statistica, Italy, [3] Central Statistics Office, Ireland. IMF = International Financial Statistics. All industrial production series are seasonally adjusted.

2. ECB interest rate changes

Date		*Repo rate level*
8 April 1999	-50 bp	2.50
4 November 1999	+50 bp	3.00
3 February 2000	+25 bp	3.25
16 March 2000	+25 bp	3.50
27 April 2000	+25 bp	3.75
8 June 2000	+50 bp	4.25
31 August 2000	+25 bp	4.50
5 October 2000	+25 bp	4.75
10 May 2001	-25 bp	4.50
30 August 2001	-25 bp	4.25
17 September 2001	-50 bp	3.75
8 November 2001	-50 bp	3.25

Source: European Central Bank**.**