Central Bank Transparency: a market indicator

Peter Howells and Iris Biefang-Frisancho Mariscal*

Abstract

It is widely believed that monetary policy outcomes are generally enhanced if the conduct of policy by the central bank is widely understood by other agents in the economy. This widespread belief has given rise to a number of attempts to measure the 'transparency' of monetary policy in various regimes.

Unsurprisingly, the degree of transparency depends upon a variety of institutional arrangements peculiar to each monetary regime. Thus, the dominant approach to measurement relies upon identifying a range of legal and other formal characteristics - in a manner very reminiscent of the central bank independence literature of fifteen years ago. This approach is not entirely satisfactory, however, since it is agents' perceptions of the degree of transparency that matters if transparency is to have any effect on policy outcomes. This has given rise to other methods of measurement which survey the views of agents. While this is potentially more relevant, it is obviously possible that their statements may differ from their actions.

This paper takes a different approach which is to look at the extent to which money market interest rates anticipate central bank announcements of changes in policy rate in the case of the Bank of England (post-1997), the ECB and the (ex-) Bundesbank. In contrast with earlier studies which all claim to find significant (but not consistent) differences between the degree of transparency in each of these regimes, evidence from money market behaviour suggests that the degree of transparency is comparable across all three.

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I. Introduction

In the last twenty years, there has been a large-scale shift in the institutions of monetary policy towards the creation of central banks which are independent of government. There has also been a convergence of opinion on the goal of policy, with overriding importance given to price stability (variously defined). There is also widespread agreement that the appropriate policy instrument is a short-term interest rate at which the central bank makes liquidity available to domestic money markets, though precisely which interest rate that is may vary between systems (Borio, 1997).

The theoretical case for independence is usually credited to Rogoff (1985), drawing on Kydland and Prescott (1977). The *empirical* support came later in studies that appeared to show a correlation between the degree of independence enjoyed by central banks and success in achieving low inflation. Typical such studies are Grilli, Masciandaro and Tabellini (1991) and Alesina and Summers (1993). This empirical investigation inevitably required some measurement of the degree of independence. Typically, this was carried out by looking at various institutional features of central banks. These included such things as the powers and responsibilities of the bank as set out in its charter, the terms of appointment of the Governor and directors and the role of the central bank in government finance. Each bank was given a numerical score on each criterion and the scores were aggregated. In the circumstances, the evidence relied heavily upon 'official' documents prescribing central bank conduct and was thus exposed to the risk that central bank 'practice' might diverge from 'theory' in some cases (Cukierman, 1992, p.360).

In recent years the debate over the optimum behaviour of central banks has moved on, though there are striking parallels with the earlier debate about independence. The issue now is whether monetary policy outcomes are related to the degree of central bank 'transparency' and this raises the inevitable question of how we measure transparency. The parallels continue. Blinder *et al* (2001) can be read as giving an account of transparency in the conduct of monetary policy in various central banks including the Federal Reserve, the ECB and the Bank of England, though there is no explicit definition and measurement. Fry *et al* (2000) do construct an index but this is based on survey responses which may be contaminated by what central bank officers would like their degree of independence to be. Most interestingly of all, Eijffinger and Geraats (2002) take an approach which is very similar to that of the independence literature by looking at the official documents relating to the conduct of a variety of central banks.

Useful as such measures are, they suffer from two general defects. Firstly, they cannot tell us how transparent the monetary authorities are *perceived to be* in practice. In other words, how do these varying degrees of transparency affect market agents? Since much of the interest in transparency lies ultimately in how it contributes to the effectiveness of monetary policy, this is a rather important question.

Secondly, the measurements so far can only help us judge the *relative* degree of transparency between central banks. Few would probably argue with the Eijffinger/Geraats (2002) findings that the Reserve Bank of New Zealand is marginally more transparent than the Bank of England and that both are more transparent than the ECB. But just how transparent is that?

In this paper we offer another measure of transparency. The importance of the addition is firstly that we focus explicitly on the reaction of market agents. We look at the response of short-term money markets to changes in central bank rate and in particular at the degree to which market rates anticipate changes in the official rate. Secondly, the results enable us to say something about the *absolute* degree of (perceived) transparency. For example, suppose that changes in the Bank of England's repo rate are 50 per cent anticipated by the day of the announcement. This tells us something about the *extent* of transparency in the UK as well as forming the basis for later comparisons with other central banks. In looking at money-market reactions, we focus only upon the Bank of England, the ECB and the Bundesbank (as was).

In the next section we review briefly the arguments in favour of 'transparency' in the actions of monetary authorities. In section 3 we look at existing work on the measurement of such transparency and compare those approaches with the one adopted here. In section 4 we explain our sources of data, our statistical methods and results. In section 5 we present and discuss the results.

II. The case for transparency

Macroeconomics has come a long way since the days of the policy-ineffectiveness proposition associated with Sargent and Wallace (1975, 1976). For various reasons - transaction costs, price rigidities, 'irrational' expectations - anticipated monetary policy does have effects on real variables and these effects can be persistent. In practice, therefore, monetary policy makers are faced with maximising an objective function which contains preferences for *both* the inflation rate and the stability of real output, as follows:

$$W = \alpha(\pi - \pi^*)^2 + \beta(y - y^*)^2 \qquad (1)$$

where π is inflation and y is output, π^* and y^* are target values and α and β are the preference parameters.

Within this context, the case for transparency and openness in monetary policy making has been put in a number of different forms, each placing different stress upon what exactly it is to be open about.[1]

One argument, for example, is that being open about the inflation target, and about the preference term α being placed upon it, is that this helps to reduce inflation bias since policy-makers know that they will be held to account by a public which can observe clearly any departure in outcome from intention. Conversely, success in these circumstances enhances central bank credibility and greater credibility increases the effectiveness of policy by encouraging agents to fall in line in response to changes in instrument settings more readily than they would otherwise have done. (Chortareas *et al.,* 2002)

A second argument is that transparency, when it extends to the model of the economy with which the policy-makers are operating, helps anchor the public's expectations about future policy moves (Bean, 1998 p.1796). This is the main argument behind Mervyn King's ambition of making monetary policy 'boring' (King, 1997, p.440). If agents understand how the central bank's mind works, then they can anticipate the next policy move, as though they were making policy for themselves. In these circumstances, the 'news' is in current economic developments and not in any subsequent interest rate change that the central bank might initiate in response. If this can be achieved, then monetary policy actions themselves no longer risk adding to the noise and general instability in the economy.

A third argument follows from the breakdown of the policy ineffectiveness proposition. This is that monetary policy actions do have an effect upon the real economy but that the transmission mechanism often involves medium or long-term interest rates, while the policy instrument is invariably a very short-term rate. What links the two is often said to be 'expectations' and from this it is argued that agents' expectations are more likely to be correct if they fully understand the thinking behind the authorities' actions. If all this is true, then policy transparency enhances the effectiveness of stabilisation policy. (Blinder *et al.,* 2001; De Haan and Amtenbrink, 2002; Woodford, 2001; Freedman, 2002).

A fourth argument for transparency links it to accountability. Indeed, the two are sometimes inadequately distinguished (see, for example, Issing, 1999). 'Accountability', strictly speaking, refers to the extent to which (and maybe also the manner in which) policy-makers can be criticised or otherwise sanctioned for the outcomes of their *actions.* Thus, for example, members of the Bank of England's monetary policy committee are regularly interviewed in public by parliament's Treasury Select Committee, while the Governor has to write an open letter explaining any divergence of the inflation outturn from the target greater than one percentage point (Budd, 1998). 'Transparency' by contrast refers to words or *intentions*. An action may lead to successful or unsuccessful outcomes but,

successful or unsuccessful, it may or may not be consistent with *intentions*. The link between accountability and transparency is that, in the presence of the latter, we can judge whether an unsuccessful action (and it will usually be *un*successful actions which are examined) was consistent with intentions and the policy-makers' own views of the correct economic model. 'Whatever other arrangements concerning democratic accountability may exist, their scope is limited without transparency because information concerning the behaviour of central banks is crucial for the evaluation of its performance' (De Haan and Amtenbrink, 2002. See also Amtenbrink, 1999).

The stress upon accountability, and therefore by extension on this particular facet of transparency, has its origins in the earlier debates about the merits of independent central banks. Removing the conduct of monetary policy from government is a fundamentally undemocratic act. One way of mitigating this is to make the monetary authorities accountable to the general public by some other route, via parliament and the media in most cases. (King, 1997).

For a central banker's view of the merits of transparency, we can turn to Otmar Issing of the ECB. All four arguments can be detected in the following quotation.

> In a democratic society, a high degree of transparency and accountability in monetary policy making reinforces the legitimacy of the central bank and consolidates the public support for its price stability mandate. Moreover, transparency imposes discipline on policy makers and is meant to ensure a general understanding of the monetary policy strategy. In turn, this may add to the credibility, and thereby the effectiveness, of monetary policy,… (Issing, 2001, p.13)

The merits of transparency have been widely accepted based probably, for most people, on some combination of arguments three and four above. However, the distinction made by Eijffinger and Geraats (2002) between five different types or meanings of 'transparency' is a warning that the case is not so simple as might be initially imagined. And critics of some aspects of the 'pro-transparency consensus' can be found. Daniel Thornton (2002), for example, has attacked the link between openness and credibility. Firstly, he argues, transparency is not *necessary* for credibility. In support of this, he cites the cases of the Swiss National Bank and the Bundesbank, both of which had a very high reputation for their consistent conduct of monetary policy, while giving out very little information about the decision making process. Neither, he says, need openness *enhance* credibility. Imagine the case where a central bank declares an inflation objective of one per cent (in his example) with no information about the debate, voting records etc. Then compare this with the case where the same decision is announced with the simultaneous release of minutes which show the debate was highly contentious, and the decision was taken by a majority of one, in the face of strong opposition which argued that the objective was set too low. Which mode of operation would make the target more credible? Credibility, Thornton argues (Thornton, 2002, pp.11-12), comes from doing what you

say you will do and doing it consistently, not by explaining the background. If we amend Thornton's example and replace setting the inflation target by setting the instrument level, then Thornton's critique is an echo of an argument that Otmar Issing (e.g. 1999 p.512) has advanced on behalf of the ECB's refusal to publish minutes and voting records. This is that with the ECB Council made up of the representatives of national central banks, commentators would concentrate upon splits and divisions, linking them to national preferences and circumstances, leading to lobbying and pressure on members of the Council, maybe to change their vote next time. Imagine now an interest rate change which was voted through by a small majority. Would this change be more or less 'credible' if accompanied by minutes and voting records?

There is a link also from this argument to the argument that transparency helps with output stabilization. Recall that this draws upon the idea that long rates might adjust to movements in short rates more readily if agents understand what policy-makers are thinking. By contrast, Thornton argues, what makes long-term rates respond to changes in short-rates is the belief that changes in short-rates will *persist*. Let us assume that the US Federal Reserve is averagely transparent (it scores fifth of nine on the Eijffinger/Geraats index). Blinder *et al.* (2001, p.9) argue that in the period 1996 to 1999, one could see quite large movements in US bond prices in reaction to small changes in the federal funds rate and one could interpret this as evidence that bond markets had learned enough about US policy-making to be able to forecast movements in the FFR. But, as Thornton points out (Thornton, 2002, pp.7-8), markets were no less well-informed about the Fed's policy-making in 2001, when a 475 basis point change in the FFR caused very little change in bond rates. It was precisely *because* the markets understood that the Fed was making a short-term adjustment, taking the FFR into a range that could not be sustained, that long-term rates showed little adjustment. It is not openness that matters here, but persistence.

As for the final argument, that transparency is part of the deal that is made with community for placing monetary policy in the hands of an unelected body, Thornton sees no conflict of principle between secrecy and democratic accountability. We accept the need for secrecy as an essential element in an effective security policy. Economists have even been heard to argue that some degree of secrecy might be a good thing for central banks themselves, when applied to intervention in the foreign exchange market. The question should be 'what set of institutional arrangements makes for the most effective conduct of monetary policy'? When we have answered that, and *if* then we can have transparency *as well*, all well and good. But the ordering must be lexicographical. Effectiveness first; transparency next (Thornton, 2002, p.6).

While the benefits of transparency may be widely accepted in monetary policy debates, it may be that the arguments deserve closer attention. And even if there is some degree of consensus that transparency is in general 'a good thing', this does not mean that we are very near a consensus on 'how much' transparency is optimal (Cukierman, 2001). But we turn our attention now to attempts to *measure* the transparency of different policy regimes.

III. Measures of transparency

The widest survey of monetary policy framework characteristics was carried out during 1998 by Maxwell Fry and others, largely by questionnaire. Covering 94 countries, the characteristics range well beyond those relating to transparency. From this information, the authors decline to create an overall index of transparency because, as they say, it is impossible to arrive at a set of weights which reflects the importance of different institutional characteristics in such a widely differentiated set of environments (Fry *et al*, 2000, p. 73). In scoring regimes against twelve questions relating to 'policy explanations', however, they do in effect provide a ranking of central banks against a significant dimension of transparency. On the basis of answers to such questions as the publication of minutes and voting decisions Sweden and the USA are rated first equal with 95 per cent of the possible maximum score. The UK comes in third at 94 per cent and New Zealand fourth at 92.Germany is 25th equal (with South Africa) on a score of 70 per cent.

A more recent and explicit attempt to measure transparency is the work reported in De Haan and Amtenbrink (2002). This differs from Fry *et al.* (2000) by focusing on what central banks actually *do,* which might make their actions more comprehensible, rather than upon central bankers' views of their own conduct. The examination was conducted for the ECB, The Federal Reserve System, the Reserve Bank of New Zealand, the Bank of England and the Deutsche Bundesbank by identifying fourteen different areas of conduct as symptomatic of transparency. Examples include publication of an inflation forecast, publication of the schedule of meetings, publication of minutes, quantified objectives etc.

For most areas of conduct, the central bank could score '1' (contribution to transparency) or '0' (no contribution). Interestingly, however, some indicators were scored on a scale 0, 1, 2, recognising that some activities made potentially greater contributions to transparency than others (we return to this later). Examples include the immediate announcement *and explanation* of interest rate changes and the regular publication of an inflation report. The maximum total score is 19. Out of this maximum, the Reserve Bank of New Zealand scores 19 (if one ignores the fact there can be no minutes or voting records since the interest rate decision rests with the Governor); the Bank of England scores 18, the ECB 16 and the Federal Reserve only 11.

The approach adopted by De Haan and Amtenbrink, as they readily acknowledge, is similar to that of Gros and Bini-Smaghi (2001). Both score central banks for evidence of critical aspects of behaviour that contribute to transparency. There are, though, detailed differences in scoring methods and in the number and precise definition of the criteria employed.

Another attempt to measure transparency which is rather different from that of De Haan and Amtenbrink and Gros and Bini-Smaghi (but is very reminiscent of the central bank independence literature of ten years ago) is the study done by Eijffinger and Geraats (2002).[2] This was based upon an examination of official documents relating to the conduct of the monetary authorities. Such

documents had to be in the public domain, in English, in June 2001. As the authors point out, this has some merit over the survey approach of Fry *et al* in that it examines what the rules say about the conduct of policy rather than what central bank officials might like to think.[3]

A further strength of Eijffinger and Geraats is that they distinguish several different 'aspects' of transparency: political, economic, procedural, policy and operational. To measure each of these five aspects they asked three questions, answers to which could score between 0 and 1. Against the potential maximum of 15 (= 5×3×1), the most transparent were the Reserve Bank of New Zealand (13.5), the Swedish Riksbank (12) and the Bank of England (12.5).

However, a number of critical points can be made which apply in different degrees to all of these studies. The first is that the results may be susceptible to the weightings chosen for each indicator of transparency. In Eijffinger and Geraats, for example, each of the five aspects was tested against three criteria. Since the overall score was arrived at by simple addition, each criterion has equal weight (=1 by implication). Thus a central bank which has an explicit contract with the government gets the same credit for transparency as a central bank which discloses an explicit policy inclination after every decision. This may or not be reasonable, but it deserves careful thought. De Haan and Amtenbrink's decision to score some criteria on a 0-1 scale and others on a 0-2 scale was some attempt to tackle this problem.

Furthermore, as Cukierman (1992) warned, focusing upon official documents will fail to pick up any divergence between theory and practice. He was thinking primarily of less developed countries where rules were not always assiduously observed. Such divergence is much less likely in the case of the nine high-income countries whose central banks were examined by Eijffinger and Geraats, but it is a caution worth remembering.

Thirdly, as we said in our introduction, the results provide only a relative measure of transparency. We might agree with the Eijffinger/Geraats and De Haan/Amtenbrink results that the Reserve Bank of New Zealand is marginally more transparent than the Bank of England. (But there is clearly scope for dispute about the ECB which Gros and Bini-Smarghi rate quite highly compared with the others). The question which remains is just how transparent is 'most transparent'.

Finally, there is the problem that none of these studies examines the degree of transparency as perceived by market agents, which is, after all, where it really matters. Fry *et al.* look at central bankers' views of themselves; De Haan/Amtenbrink and Gros/Bini-Smaghi look at behaviour which *ought* to be interpreted as transparent; Eijffinger/Geraats look at the rules governing central bank behaviour.

De Haan and Amtenbrink recognise the problem, at least as it applies to the ECB. 'Despite the comparatively high score for the ECB interms of transparency, there are indications that financial markets do not have a good understanding of the ECB's strategy…' (De Haan and Amtenbrink, 2002, p.10). The evidence comes from two sources. One is a survey by Goldman Sachs (2000) in which a sample of UK financial market participants was asked to rate the Bank of England, the ECB, the

Federal Reserve and the Bundesbank (pre-1999) on a scale of 1-5 according to how well they (the market participants) thought they understood the reasoning behind the decision-making. The Federal Reserve was way out in front with an average score of 4.3 (5 representing maximum transparency) while the ECB came a very poor last (and the Bank of England doing none too well).

Table 1: Central bank transparency - rankings by study

	Fry *et al*	Eijffinger & Geraats	De Haan & Amtenbrink	Gros & Bini-Smaghi	Goldman Sachs*	De Haan et al (Ifo)*
Australia	15=	7=	-	-	-	-
Canada	13=	4	3	-	-	-
D Bundesbank	25=	-	6	5	2	5
Eurozone	-	5=	4	2	4	6
France	40=	-	-	-	-	4
Italy	12	-	-	-	-	1
Japan	5	7=	-	-	-	3
New Zealand	4	1	1	4	-	-
Sweden	1=	3	-	-	-	-
Switzerland	8=	9	-	-	-	-
UK	3	2	2	1	3	2
US	1=	5=	5	3	1	7

Sources: see text. Note: * = survey of market opinion

The second source was a survey by De Haan *et al* of the views on central bank credibility and transparency held by professional economists participating in the Ifo Institute's *Economic Survey International*. On transparency, the ECB and Federal Reserve come bottom in a list of seven, headed by the Banca d'Italia. Clearly, as our summary Table 1 shows, there is considerable scope for divergence between transparency as measured by any 'objective' criteria and transparency as perceived by market participants. The rest of this paper is an attempt to test the perceptions of market participants in a different way.

IV. Data and method

In the efficient markets literature, prices (or returns) adjust to news so quickly that it is impossible for investors to make abnormal profits by basing buy/sell decisions on official announcements.[4] The speed of adjustment depends upon traders being able to read all publicly available signals and to interpret the information in accordance with the 'correct' model which generates prices (or returns). Using a similar idea, we look at evidence that financial markets can anticipate central bank interest

rate decisions. If they can, then this is evidence that they understand how the central bank's 'mind' works, i.e. that they understand the model which the central bank uses to set interest rates. This, in turn, suggests that the central bank has been able to communicate this model effectively, through publication of its inflation report, post-interest-rate-setting press conferences, minutes of meetings, or whatever.

Studying the relationship between changes in a central bank's official rate (hereafter the 'policy rate') and market rates is not, of course new. In the UK, for example, Spencer Dale examined the link between the Bank of England's 'band 1 stop rate' and market interest rates at maturities of 1, 3, 6, and 12-months and 5, 10 and 20-years, for 30 changes in that stop rate between January 1987 and July 1991 (Dale 1993). The purpose was to explore the link from the policy rate to the longer term rates that are generally thought to have the greater effect upon aggregate demand. Dale and Haldane (1993) examined the response of a wide range of interest rates (on loans, mortgage, credit cards, deposits etc.) to changes in the policy rate in order to observe what happened to various interest rate differentials or 'spreads', on the grounds that what happens to relative rates may be important for policy. Similar motives lay behind the Biefang-Frisancho and Howells (2002) paper on spreads between loan-deposit-bond rates. Shelagh Heffernan (1997) also examined the behaviour of a range of (largely bank) interest rates in response to a change in policy rate in order to examine the degree of competition in the UK banking industry. Nearer still to our present interests is the paper by Mervyn King (King, 1995) in which he used changes in the yield curve to extract information about market expectations of future nominal interest and inflation rates following policy upheavals such as entry to and exit from the European exchange rate mechanism. The issue on that occasion was not transparency but the credibility of the Bank of England's policy stance after the adoption of inflation targeting. Closest of all is the recent work by Haldane and Read (2000) where the behaviour of different segments of the yield curve are used to detect signs of imperfect transparency (the short end) and credibility (the long end) for several central banks including the Bank of England pre-independence.

In this paper we use the response of short-term markets rates to announcements of a change in policy rate as an indicator of transparency on the part of the (ex) Bundesbank, the ECB and the Bank of England post-independence. In particular, we wish to see whether market participants can perceive significant differences in the degree of transparency, as most of the studies in Section 3 suggest they should. Although we focus only on three central banks, the methods employed here can easily be applied to other regimes. There are two essential requirements: firstly, that daily data is available for the relevant interest rates; secondly that interest rate decisions are announced on dates which are known in advance.

The investigation is organised in two phases. Firstly, we examine a *range* of money market rates in each of the three regimes for evidence of anticipation of the policy rate change. In making this selection we were constrained to some degree by the range of rates available on a daily basis from the respective central banks. Table 2 summarises.

Table 2: Short-term market rates

ECB 1999-2002	DB 1989-99	BE 1997-2002
Overnight (eonia)	Overnight	Overnight
1 month euribor	1 month	3 month CD
3 month euribor	2 month	3 month interbank
6 month euribor	3 month	5 year bond
1 year euribor		

To test for evidence of anticipation, we focused, for each regime, on those dates in which there was a change in the policy rate. Table 3 shows the total number of announcement dates in each regime over the relevant period, and the number of increases and decreases in the policy rate.

Table 3 : Announcement of Policy Rate

	ECB	DB	BE
No Change	61	219	36
Increase	7	8	10
Decrease	5	14	14
Total Announcements	73	241	60

For each occasion of a change in the official rate, we examined the change in each market rate on the four days preceding the announcement, cumulated the change, and then expressed the cumulated change in the market rate as a fraction of the official change.

To make the procedure clearer, table 4 shows an extract from our examination of changes in one of the UK short term market rates (5-year bond rate) in response to a Bank of England policy rate change. The first two columns show the date and the announced policy rate respectively. In column 3 the change in the policy rate is expressed as a change in basis points (-50 b.p.). In column 5, we can see the *level* of the 5-year bond rate on the announcement date itself, (t_0), and on each of four days before and two days after the announcement. Column 6 shows the daily *changes* in the bond rate (again in basis points). Column 7 cumulates the changes recorded in column 6 and expresses the *cumulation* as a fraction of the policy rate change. Thus we can see that the change in bond rate is −7.37 b.p. on *t-3* and this is followed by a further −0.12 b.p. and −6.67 b.p. on *t-2* and *t-1*. By the day of the announcement, the cumulated change in the 5 yr bond rate amounts to .284 of the change in policy rate.

Table 4 :Changes in the Bank of England Policy Rate and 5 Year Bond Rate

Date	*Policy rate*	*Change (in bp)*	*Day*	*level*	*Change (in bp)*	*As cum. fraction of official change*
			-4	4.5168		
			-3	4.4431	-7.37	0.1474
			-2	4.4419	-0.12	0.1498
			-1	4.3752	-6.67	0.2832
08/11/01	4.0000	-50.0	0	4.3748	-0.04	0.284
			1	4.3542	-2.06	0.3252
			2	4.3348	-1.94	0.364

We then calculated the mean response across all cases of an announced change in policy rate for each of the market rates. We also calculated the corresponding standard deviation. The results are summarised in table 5. If we take the first column of results for the Bundesbank, as an example, we can see that, on average (the mean), the cumulative change in overnight interbank rate as a fraction of the change in policy rate was about 0.67. In Table 5 we also show the median values. This is because closer examination of the data shows that there are numerous outliers. This is especially true for the Bundesbank and the Bank of England. These characteristics are to some extent captured in the high standard deviation figures and the differences between the median and the mean.

Taking the results at face value, four conclusions are immediately striking:

- The degree of adjustment, whether measured by the mean or the median, decays consistently with maturity. (The change in 1 year euribor was so small we have ignored it). The maximum adjustment in all cases occurs with the overnight rate. On the basis of the average, the largest adjustment, nearly 80 per cent, occurs for UK overnight rate. The median, although indicating a more modest adjustment of only about 44 percent, still shows the highest adjustment for the UK.
- In each case the standard deviation is quite large, suggesting that the mean value is the result of a very wide dispersion of individual outcomes. The result for the Bank of England needs especially careful interpretation. The high figure for mean adjustment, suggesting a high degree of ‘anticipation’, is heavily influenced by a number of ‘overshoots’ and several adjustments in the wrong direction! We return to this in a moment.

Table 5: Cumulative adjustment as a fraction of the policy change.

Bundesbank, 1989-99

	O/night	1 month	3 month	6 month
Median	0.40	0.40	0.26	0.16
Average	0.67	0.31	0.24	0.20
Std deviation	0.43	0.34	0.22	0.24

Bank of England, 1997-2002

	O/night	3 month CD	3 month interbank	5 year bond
Median	0.44	0.22	0.14	0.06
Average	0.79	0.22	0.16	-0.02
Std deviation	1.70	0.31	0.26	0.44

ECB, 1999-2002

	O/night	1 month	3 month	6 month
Median	0.39	0.33	0.20	0.26
Average	0.45	0.31	0.27	0.28
Std deviation	0.79	0.41	0.38	0.37

- The degree of anticipation is, overall, rather low. For a rate on a very close substitute, in a market dominated by well-informed professionals, the degree of adjustment in overnight interbank rate ranges from 0.45 to 0.79 on the basis of means and 0.39 to 0.44 on the basis of medians. (And for rates of longer maturity, the adjustments are markedly smaller).
- Nonetheless, whichever measure is chosen, the figures do seem to suggest some degree of difference in the extent to which market participants can anticipate a change in policy rate. The task appears to be easiest in the UK, but hardest in the ECB where it appears to have been made more difficult than it was under the Bundesbank.

The fact that the mean of the UK overnight rate reported in Table 5 is the outcome of very large deviations, including both overshoots and perverse movements is explained by the institutional details of policy rate setting in the UK. From 1981 to 1997 the Bank operated mainly upon treasury bills with a maturity up to 14-days ('band 1' bills) and 14-33 days ('band 2' bills) (Dale, 1993; Dale and Haldane, 1993). Since then it has focused its attention upon 14-day repo deals in UK gilts. This means that when the market anticipates (for example) a rise in the policy rate, commercial bank treasurers anticipate a capital loss on 14-day instruments and take the standard avoidance procedure which is to switch into assets with maturities of less than 14 days. Hence, if we look at interest rates on assets with less than 14 days to maturity, we find that those rates *fall* as funds are switched into

them. Given the expectation of a policy rate cut, the reverse happens. In effect what we see is a tendency for short -term rates to 'pivot' about the 14-day rate. Commenting on market reactions to its decision to raise official rates in October 1996, the Bank of England reported:

> Pivoting is a commonly observed phenomenon when the market attaches a high probability to a change in official interest rates in the near term: in this case expectations of a rise in official interest rates caused market rates at one month to rise to a level above the existing level of official interest rates…, while market interest rates at shorter maturities generally traded below the level of official rates, as ample bill offers were generally made to the Bank in its daily operations (Bank, 1997, p.9).

When a rise in policy rate is expected, rates on assets with less than 14 days to maturity fall, while rates on longer-dated assets rise. If we are to examine any short-term market rate for evidence of anticipation of policy rate changes, it has to be a rate on assets of more than 14-day maturity. For the UK, we focus henceforth on the 3-month CD rate.

Mere inspection of the data, however, is hardly sufficient. The question is whether the results in Table 5 suggest any significantly different (in the statistical sense) behaviour in market agents' responses to changes in policy rate in the three systems. To answer this question, we use the Kruskal-Wallis test (which produces a non-parametric test statistic). This tests whether the averages of any set of distributions differ significantly. We do the test for each of three pairs: the ECB and Bundesbank; the ECB and Bank of England; and the Bundesbank and Bank of England. We run the test with respect to the overnight rate and a three month rate for each regime, except the Bank of England. Our choice of the Kruskal-Wallis test is dictated by the data. The data here are high-frequency (daily) and beset with many outliers (as the difference between the means and medians in Table 5 show). The application of conventional parametric tests in these circumstances is inappropriate (see Andersen, Bollerslev and Das (1999)).

The Kruskal-Wallis test is a rank test and is given by:

$$H = \frac{12}{(n+1)n}\sum_{i=1}^{I}\frac{T_i^2}{n_i} - 3(n+1) \qquad (1)$$

where I=2 and denotes the number of series, which in our case refers to the pairs of banks; n is the size of the total sample and n_i is the number of observations of the i-th series; T_i is the rank sum for series i. Occasionally, tied observations occurred and the H-statistic was corrected as:

$$H' = \frac{H}{C} \text{ with } C = 1 - \frac{\sum_{k=1}^{K} t_i^3 - t_i}{n^3 - n} \qquad (2)$$

where k is the number of tied sets and t_i is the number of tied observations in set i. The test statistic is distributed χ^2 (I-1) under the null hypothesis of equal averages. The results of the tests are shown in Table 6.

Table 6: Kruskal-Wallis test results (1)

Dates	*Sample 1*	*Dates*	*Sample 2*	*H Value*
1999-2001	ECB o/night	1989-1999	Bundesbank o/night	0.05
1999-2001	3m Euribor	1989-1999	Bundesbank 3m interb	0.02
1989-1999	Bundesbank 3m	1997-2002	BoE 3m interb	1.43801
1999-2001	3m Euribor	1999-2002	BoE 3mth interb	0.37

Note: The critical value at the 5% significance level is $\chi^2(1) = 3.84$

On the basis of the K-W test, there is *no* indication that the means of Table 5 are drawn from different distributions when we compare the ECB:BoE, the Bundesbank:ECB or the Bundesbank:BoE, whether we look at the overnight rate or a 3-month rate. This is clearly at odds with much of the literature referred to in section 3, most of which ranks our three regimes very differently for transparency. Even if we confine our attention to those studies which, like ours, try to measure *agents' perceptions* of transparency (De Haan *et al* and Goldman Sachs) we see that they find it possible to distinguish the regimes, while we can not.

In phase two, we make a more detailed examination of a single rate in each regime. For the ECB and Bundesbank we choose the overnight rate since it is this which Table 5 tells us shows the greatest evidence of anticipation; for the UK we take the 3-month CD rate for reasons given above. We do this because there are two obvious criticisms of the results as they stand. Firstly, the high standard deviation figures obviously show that the calculated average adjustment is not a precise estimator. Secondly, and related, is the issue of other influences upon market rates. Although one might expect the behaviour of the policy rate to be the dominant influence on overnight interbank rate, there will be other, 'market' forces at work. Furthermore, these may be different between the three regimes. For example, we already know that there are differences in the precise rate which is targeted for policy purposes. Furthermore, both the ECB and the (old) Bundesbank, required banks to maintain specified reserve ratios under a system of lagged-reserve accounting. The need to be in funds on the specified date may well set-up cyclical money market forces in such a regime – the spikes in EONIA toward the end of the maintenance period are an example (ECB 2001, p.71). In the UK, these influences will be absent but others may play a role. The logical response to this is to see whether any particular forces appear to be at work in periods leading up to an announcement of change in policy rate when compared with periods leading up to an announcement of no change.

In this second phase, therefore, we plot the behaviour of the selected market rate in no-change-announcement periods. This gives us a representation of 'normal' behaviour, which we can then use as the basis for comparison of behaviour in periods leading to the announcement of 'no change'. Our next step, therefore, required us to identify not just the dates on which the monetary authorities announced policy rate changes, but also those on which they decided to leave the rate unchanged. Fortunately, such meetings took place in all three regimes on a regular cycle (with allowances for public holidays and emergencies like September 11 2001). In the ECB and Bundesbank, the meetings took place generally at fortnightly intervals; in the Bank of England they are monthly. These frequencies mean that there are usually ten trading days between meetings at the ECB (and Bundesbank) and approximately 20 trading days between announcements from the Bank of England. For each regime, we calculated the spread between overnight interbank rate and policy rate on each of the days in a 'no change' period. As table 3 shows, there were 36 such periods for the Bank of England; 81 for the Bundesbank and 60 for the ECB. For each day in the period, we then calculated the mean spread across the total number of periods. The 'unchanged' plot in the following charts is thus the mean (market-policy rate) spread on each day averaged across all 'no change' periods and represents the 'normal' behaviour of that spread.

For each regime, we then repeated this calculation in order to find the mean, day-by-day (market-policy rate) spread in those inter-announcement periods which ended with an announcement of a rise and those which ended with an announcement of a fall. This is then plotted against the spread in 'normal' or 'no change' periods.

Figure 1a: Bundesbank, (market-policy) spread, pre-rise announcement

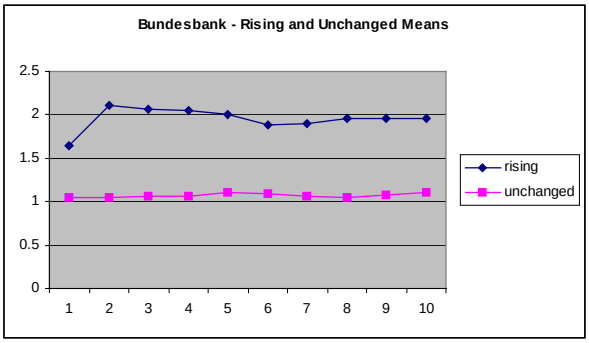
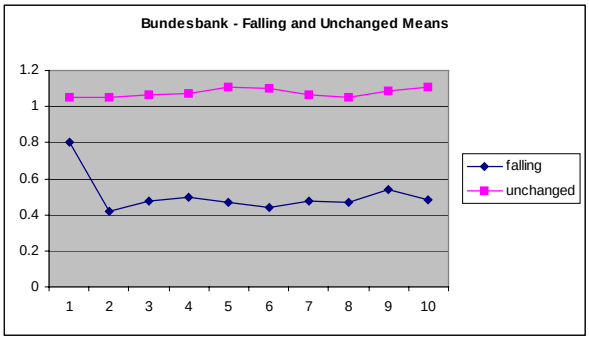


Figure 1b: Bundesbank, (market-policy) spread, pre-fall announcement



Figures 1a and 1b show that in 'normal' (i.e. 'no change') circumstances, the interbank overnight rate in the last ten years of the Bundesbank era, was about 1.1 per cent above policy rate. By contrast, the difference in behaviour in periods culminating in the announcement of a change in policy rate is very marked. Looking at figure 1a first, we can see that on days leading up to the announcement of an increase in policy rate, the spread widens (the interbank rate increases) by about

100 basis points before converging on its normal relationship on the day of announcement. How do we interpret this behaviour? It seems to suggest that banks, anticipating that the penal rate for borrowed reserves is about to rise, are less willing to lend to the interbank market, forcing up the interbank rate by about 100 basis points. Later, on the day of the announcement, the spread returns towards normal because the policy rate rises towards the already increased interbank rate. A minor mystery is why the displacement caused by the expectation of a rise approximates 100 basis points when experience tells us that changes in the policy rate are typically of the order of 25 basis points. When the convergence occurs, it follows that it depends upon *both* the expected increase in the policy rate together with a reduction in interbank rate.

In figure 1b, we can see that on days leading up to the announcement of a reduction in policy rate, the normal spread is again displaced. In this case, it is shifted downward (the interbank rate falls) by about 70 basis points before converging on normal at the time of announcement. The interpretation is the inverse of the above. Believing that the penal refinancing rate is about to fall, banks are more willing to risk a shortage and place more funds in the interbank market, causing it to fall even before the announcement. Again, it is curious that the displacement is larger (70 b.p.) than experience would lead us to expect of a change in policy rate. Reversion to the normal spread is thus the result of both a rise in the interbank rate and the expected reduction in policy rate.

Figures 2a and 2b show the behaviour of the same spread under the ECB.

Figure 2a: ECB, (interbank-policy) spread, pre-rise announcement

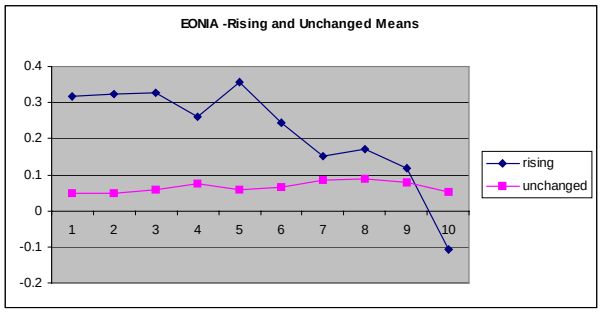
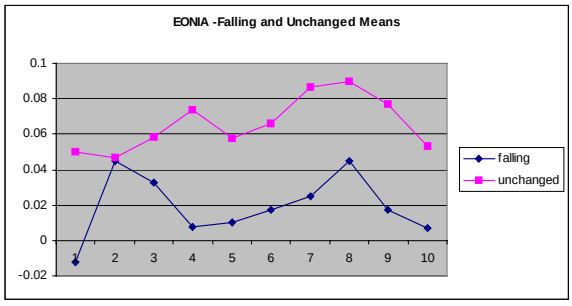


Figure 2b: ECB, (interbank-policy) spread, pre-fall announcement



In figures 2a and 2b we can see that the 'normal' relationship between EONIA (the 'eurozone, overnight, interbank, average' rate) and the policy rate varies between 0.05 and 0.085. (The variation is more clearly seen in figure 2b which is drawn to a larger vertical scale). It is notable that all three series show more variation during the inter-announcement period, which may well reflect different institutional circumstances and behaviour. As with the Bundesbank, we can see from both figures that there is a displacement of the spread from its normal level, in the direction of the subsequent change. In figure 2a, for example, in periods leading up to a rise in policy rate, the spread widens by about 25 b.p., the order of magnitude by which the policy rate does normally, in practice, change. Compared

with the Bundesbank, the displacement begins later (at around nine days before the announcement). The series also lack the convergence seen in the case of the Bundesbank. This may have something to do with the ECB's general practice of announcing the change on the day before it takes effect. In figure 2b, the displacement takes place earlier in the period, but it is again of the order of 25 b.p.

Figures 3a and 3b show the 'normal' relationship between 3-month CD rate and the UK policy rate. Figure 3a then superimposes the spread between those rates when an increase in policy rate is expected; figure 3b does the same when a fall is expected.

Figure 3a: Bank of England, (market-policy) spread, pre-rise announcement

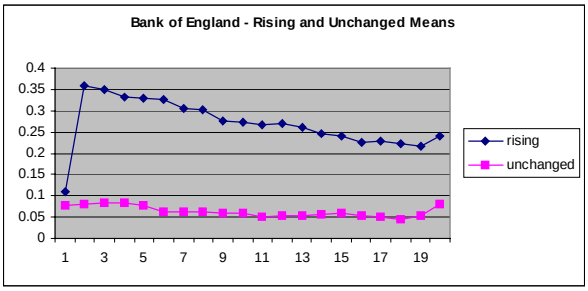
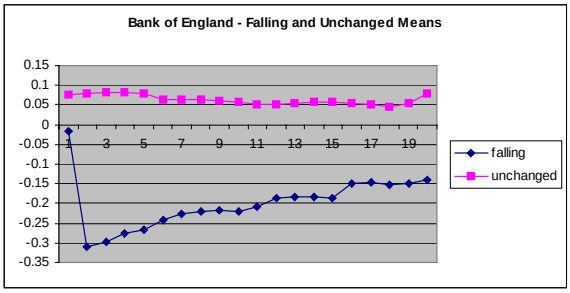


Figure 3b: Bank of England, (market-policy) spread, pre-fall announcement



Looking at 3-month rates, we observe a picture which is very similar to that obtained from ECB and Bundesbank data. The 'normal' spread between 3-month CD and policy rate is about 7 bp. In periods preceding the announcement of a rise in policy rate, the spread widens to about 25 bp and increases to about 36 bp immediately before the change before converging on the normal level when the announcement is made. In periods preceding the announcement of a cut in policy rate, the opposite happens. The spread becomes negative (c. –15 bp.), becomes increasingly negative (to a maximum of c. 30 bp.) before converging on the normal when the announcement is made.

Once again, these findings are at odds with those of earlier studies of transparency. In each of our charts it seems to be the case that the market rate adjusts in advance of any announcement of a change in policy rate. Furthermore, the shift occurs after allowing for all other influences, it occurs whether the forthcoming announcement is one of a rise or a cut in policy rate and above all, it occurs in all three regimes.

As we did with our results in Table 5, we can check for significance by using the Kruskal-Wallis test. This time, however, we are testing *within* a regime to see whether the displacement of the spread in announcement periods is significant. The results are given in Table 7.

Table 7: Kruskal-Wallis test results (2)

Regime	*Sample 1 v Sample 2*	*Test statistic*
Bank of England	Rise v unchanged	29.27
	Fall v unchanged	29.27
ECB	Rise v unchanged	7.7
	Fall v unchanged	12.8
D Bundesbank	Rise v unchanged	12.8
	Fall v unchanged	12.8

Note: Critical value at the 5% level = $\chi^2(1) = 3.84$

Taking the first line of the table, the results of the test suggest that there is a 95 per cent chance that the mean value of the spread in periods leading up to the announcement of no change in the UK policy rate are taken from a distribution which is different from that which generates the mean value of the spread in periods leading up to an announcement of an increase in the policy rate. The remaining entries can be interpreted accordingly.

V. Summary and interpretation

Rightly or wrongly, there is a widely-held view that transparency in the conduct of monetary policy is a good thing: it makes policy more effective and policy objectives can be achieved at lower cost. It is hardly surprising, therefore, that the degree of transparency attaching to the conduct of central banks has been the subject of considerable study.

Amongst the studies reviewed in section 3, there is little consensus about the ranking of central banks by their degree of transparency, though one might offer the cautious generalisation that the studies which rank on the basis of the institutional and legal characteristics place our three regimes in the order: the UK first, followed by the ECB and then the (ex-)Bundesbank. Studies which rely on agents' perceptions of transparency reverse the last two.

In this paper we have used the behaviour of market interest rates in periods leading up to an announcement of a change in policy rate as an indicator of agents' ability to anticipate official changes. We did it in two ways. In the first part of our study, we looked at the extent to which a range of short-term rates had incorporated a policy change by the time that the official announcement had taken place. On the face of it, this appears to offer *both* a measure of absolute transparency (a 100 per cent anticipation = 100 per cent transparency) *and* a means of ranking. As regards absolute transparency, the results suggest that there is a long way to go. Using 3-month CD rate for the UK and overnight rate for the other regimes, the mean values in Table 5 tell us that markets could anticipate

about 2/3 of Bundesbank policy rate changes while only 0.45 of ECB changes can be read in advance and little more than a fifth in the case of the UK. Taking median values compresses this distribution but does not change the ranking. It does though bring down the 'best' result to just 0.4.

However, we know that this is high-frequency data, characterised by wide dispersions and many outliers. When we subject it to more rigorous examination, the Kruskal-Wallis test, is unable to discriminate between them.

This led us to the second part of our study where we allowed for other influences by establishing a 'normal' pattern of behaviour for market rates against which we could examine the effect of announcements of a change in policy rate. Normal behaviour was defined as the spread between market rate and policy rate in periods leading up to no change. When we compared this normal behaviour with behaviour in periods culminating in a change in policy rate, we found, in all three regimes, that the spread was displaced in the direction that one would expect, if markets were anticipating the announcement. When we apply the Kruskal-Wallis test in these circumstances, we test whether the displacement is significant. Once again, the K-W test cannot discriminate between the regimes, but this is because behaviour *is* significantly affected by anticipation of an interest rate change, across all three regimes, and regardless of whether a rise or fall in policy rate is subsequently announced.

Contrary to much of the survey and institutional evidence, it really does appear to be the case that money market practitioners can read the ECB and the Bank of England in much the same way as they could read the old Bundesbank.

Endnotes

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1. Hence Eijffinger and Geraats (2002) distinguish five different types of 'transparency' in the conduct of monetary policy.

2. Eijffinger and Geraats (1996) review the indicators used in the central bank independence literature. Alesina and Summers (1993) is a good example of the approach.

3. The possibility of divergence is not just a remote possibility. As a check on their results, Eijffinger and Geraats sent their scoring to officials of each of the central banks concerned. In each case, the central bank thought it should have received a higher score for its degree of transparency.

4. Strictly speaking, this is the implication of the 'semi-strong' variant of the efficint market hypothesis.

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