Monetary Policy Uncertainty: Is There a Difference Between Bank of England and the Bundesbank/ECB?

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Abstract

It is widely believed that institutional arrangements influence the quality of monetary policy outcomes. Judged on its 'transparency' characteristics, therefore the Bank of England should do better than both the Bundesbank and ECB. However, studies based on market evidence show that *on average,* agents anticipate policy moves by both banks equally well. Since benefits from transparency should also show in a narrowing of the diversity in cross sectional forecasts, this paper extends the existing literature in an attempt to reconcile the contradictory evidence on 'transparency' of both banks. We show that the diversity in interest rate forecasts is greater under the Bundesbank/ECB than the Bank of England. Other factors than 'transparency' do not seem to affect interest rate uncertainty in Germany. Increasing difficulty in forecasting inflation appears to explain in part UK interest rate forecast dispersion.

Keywords: transparency, yield curve, forecasting uncertainty, Bank of England, Bundesbank, ECB

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1. Introduction

It is now widely accepted that 'transparency' in the conduct of monetary policy improves policy outcomes.[1] The reasons for this have been widely explored (see e.g. Chortareas, *et al,* 2003) and it is clear that the range of benefits is partly due to the range of meanings which can be given to the term transparency (Geraats, 2000). For the purposes of this paper, the evidence of transparency with which we are concerned (a) defines a transparent policy as one where agents can anticipate CB decisions and thus (b) sees the advantage primarily in preventing policy decisions themselves being a source of destabilising shocks to the economy. This is essentially the position taken by the Bank of England and lay behind Mervyn King's (1997) famous remark that the hallmark of a well-conducted monetary policy is that it should be 'boring'. The 'news' should be in the behaviour of macroeconomic variables and not in the central bank's subsequent reaction to them. Notice that this amounts to an ambition whereby agents will know (a) the structure of the central bank's reaction function, (b) the size of the coefficients, (c) the value of the macro-variables to which these coefficients apply and therefore (d) the way in which those macro-variables are likely to be influenced by any change in the official rate of interest.

The first publication to confirm the importance placed by central banks on the transparency of their actions was the study by Fry *et al.* (2000) which showed that some 74 per cent of banks claimed to promote the openness of their policy making. Since then, there have been numerous studies which attempt to measure the actual (or perceived) transparency of individual regimes. Such studies fall into three broad categories. Firstly, there are those which, following the central bank independence literature of some fifteen years ago, ranking central banks according to their demonstration of institutional characteristics deemed *a priori* to contribute to transparency (for example, Fry *et al*, 2000; Eijffinger and Geraats, 2002; De Haan and Amtenbrink, 2002). Secondly, there are surveys of market opinion (for example, Goldman Sachs (2000), Waller and De Haan (2004) and Reuters (recurrently)). Thirdly, there are tests of practitioners' ability to

[1] But see Thornton (2003) for some critical observations.

anticipate the decision of the policymaker. These focus upon movements in short-term money market rates surrounding the date of an interest rate decision and we turn to these in a moment.

What is apparent from the 'characteristics' and the survey evidence is that the ECB does not rank consistently highly, in spite of its constitution being drawn up in a period when transparency was at least beginning to become fashionable. Also apparent, but less surprising, since it was famously secretive (Thornton, 2003), is that its predecessor, the Deutsche Bundesbank generally ranks low in the league tables. The position of the ECB in these rankings tends if anything to confirm the allegations made by Buiter in the famous Buiter-Issing (1999) debate, based on the characteristics approach, and pointing to the lack of an inflation report and minutes or voting records of meetings as being unhelpful to agents.

What is more surprising than the moderate ranking of the ECB and Bundesbank on characteristics is the fact that *both* score highly in the third group of studies, based on what we shall call market-evidence. Relevant studies here include Bernhardsen and Kloster (2002); Coppell and Connolly (2003); Haldane and Read (2000); Hardy (1998); Perez-Quiros and Sicilia (2002) Ross (2002) and Wadhwani (2001). These are invariably comparative studies and (although countries in the comparisons vary) what generally emerges is that money market practitioners found it no more difficult to anticipate the interest rate decisions of the Bundesbank, or later the ECB, than they do, say, the actions of the Bank of England or the Federal Reserve. Writing in the *Bank of England Quarterly Bulletin* in 2001, Wadwhani reported that 'The results of this exercise [covering the period 1997-2001] suggest that the average market 'surprise' on the day of an interest rate decision has been higher in the UK compared with the United States and Europe' (Wadwhani, 2001, p.355). Coppell and Connolly (2003) looked at market anticipation in Australia and compared it with other regimes including the USA, UK, Canada and Germany. The data covered the period 1996 to 2002 (and thus for Germany covered a period of both Bundesbank and ECB policy-making). They found '…it [was] not possible to reject the hypothesis that the level of anticipation by the markets of a rate move in each country [was] equal'.

It is perhaps not altogether surprising that the results from the 'characteristics' approach and from market interest rates should differ. Listing rather arbitrary characteristics and attaching (even more) arbitrary weights to them received a critical press at the time of the independence investigations and the results deserve to be treated with caution. What is more remarkable is that the practitioners whose actions in money markets appear to confirm that they can 'read' the ECB and (could read the) Bundesbank tolerably well, are substantially the same agents who report themselves as uncertain or confused by the ECB and Bundesbank behaviour in the surveys. In this paper we try to shed some light on this apparent paradox.

We do this by making use of additional information provided in cross sectional data, which allow us to examine the dispersion of views amongst agents when they predict future relevant variables.[2] As quoted in previous paragraphs, there is overwhelming evidence that *on average* agents anticipate Bank of England policy no better than Bundesbank or ECB policy. However, transparency should not only reduce the size of *average* policy surprises, but greater benefits from transparency should also be apparent in a *narrowing* of the diversity in cross sectional forecasts. This paper is concerned with answering the following questions: (i) Has the spread of market rate forecasts changed over time and does it vary under different regimes? If transparency reduces uncertainty, then we would expect a greater decline in the dispersion of forecasts under the Bank of England than under the ECB regime. (ii) Has the forecast spread of key macro variables changed in Germany and the UK and if so has it changed in different directions? The dispersion across forecasts may have changed because the economy is more stable and thus easier to forecast. For example, since macroeconomic forecasts enter the reaction function of the central bank, an increased convergence of view about the future path of interest rates may be due more to greater certainty about future economic developments than to greater transparency. (iii) Is the change in forecast diversity an important variable in explaining the dispersion of forecasts regarding money market developments?

Since the observation that agents' *behaviour* in money markets is at odds with their reported *perceptions* in surveys and with what one might expect from regime characteristics, we test in section 2 the hypothesis that while agents anticipations *in aggregate* may be broadly correct, underlying this 'average' outcome there may have been an increasing dispersion of individual views about the next movement in interest rates. In section 3, we look at why this might be the case, by looking at agents' views about the two key variables in the central bank's reaction function, namely the rate of inflation and the trend in output. In section 4 we summarize and conclude.

2. Money market rate uncertainty

Our thinking here is that while, *on average* (or in the aggregate), agents' anticipation may not have changed, or even may have improved, it is perfectly possible for this to be accompanied at the same time by increasing uncertainty on the part of *individual* agents. What the results may be telling us about *average* behaviour, may be concealing a change in the degree of unanimity across agents. A greater dispersion of view would in turn indicate greater insecurity vis-à-vis monetary

[2] The only other study we are aware of which also uses cross-sectional data to analyse the potential benefits of transparency is Swanson (2004) for the USA.

policy which would not show up in the estimations of average central bank policy anticipation but would be reflected in agents own perception of the difficulty of forming a judgement. In the case of Germany, it may also shed some light on the difference between results from money markets which find policy anticipation high and the characteristics and survey evidence which find it low.

In order to measure the degree of unanimity with which private agents anticipate interest rate changes by the central bank over time, we looked at the range and standard deviation of forecasts by private institutions as reported in *Consensus Forecasts*. Every month, this publication shows the forecasts for, *inter alia,* the 3-month euro-DM interest rate (i.e. the rate on 3-month deposits in euros in Germany) and the 3-month interbank rate for the UK for some 25 private sector institutions (although this number of institutions reporting forecasts varies somewhat during the year). The forecasts are in both cases for 3 and 12 months ahead. We use two measures of volatility: the standard deviation of the forecasts of the private agents as reported in *Consensus Forecasts,* and we calculated the range for the third highest and third lowest forecasts (which is about the 12^{th} and 88^{th} percentile of the distribution) and compared them over time. Any changes in the cross-sectional distribution of forecasts are interpreted as a change in uncertainty with which individual private agents forecast central bank policy. The sample period is from January 1994 until May 2004.[3] Table 1 presents basic summary statistics on the forecasting dispersion data.

Table 1:
Descriptive statistics of interest rate forecast dispersions under BoE and BB/ECB regimes

Variable/Statistic	*mean*	*median*	*min*	*max*	*SD*
3mRange(BB/ECB)	0.368	0.4	0.1	0.7	0.13
3mRange(BoE)	0.492	0.5	0.1	0.9	0.17
3mSD(BB/ECB)	0.163	0.2	0.1	0.3	0.05
3mSD(BoE)	0.217	0.2	0.1	0.3	0.06
AnnualRange(BB/ECB)	0.758	0.7	0.3	1.4	0.25
AnnualRange(BoE)	1.219	1.2	0.5	2.5	0.4
annualSD(BB/ECB)	0.317	0.3	0.2	0.7	0.1
annualSD(BoE)	0.504	0.5	0.3	0.9	0.14

[3] Due to the lack of data, we cannot distinguish between pre- and post inflation targeting for the UK. We tried to test for a break in anticipation due to Bank of England independence. However, we could not find a significant break (Biefang-Frisancho Mariscal and Howells, 2007).

In all cases, *average* forecast dispersion is lower and *median* dispersion is either equal or lower under Bundesbank/ECB than under the Bank of England. Throughout, the variation of the forecast dispersion (standard deviation or SD) is higher under Bank of England than under Bundesbank/ECB. Apparently, agents are on average less uncertain with respect to Bundesbank/ECB monetary policy than they are with Bank of England policy. Also, average variation of uncertainty seems to be higher under the Bank of England regime. These preliminary results suggest that agents should feel more confident about Bundesbank/ECB than Bank of England policy. Recalling that our aim is to shed some light on the contradictory evidence of agents' perception on monetary policy transparency of the two banks and their ability of anticipating equally well under both regimes, these preliminary descriptive results indicate that agents should also perceive Bundesbank/ECB as more transparent than Bank of England. However, agents' perception on monetary transparency may be more importantly determined by how their forecasting uncertainty changes over time.

We turn to this issue next by trying to find out how the distribution of forecast views has changed over time, since attempts to improve agents' understanding of policy decisions have been to some extent incremental.[4] Thus we estimate for both countries the trend behaviour of this variation by the following equation:

$$Dispersion_{t,i} = \alpha_i + \beta_i(L)dispersion_{t,i} + \tau_i Trend + \varphi_i Trend^2 + e_t \qquad (1)$$

The dependent variable *dispersion* stands for the *forecast range* or the *forecast standard deviation* and the subscript *i* distinguishes between the quarterly and one-year ahead forecasts. Thus, the range of views about future interest rate developments is measured in four ways: (1) by the 3-month-ahead and (2) the 1-year ahead forecasting range of the short-term money market rate, denoted by 3mRange and annualRange, respectively, as well as by (3) the 3-month-ahead forecast standard deviation (3mSD) and (4) the 1-year-ahead forecast standard deviation (annualSD). The lagged dependent variable was included to reduce serial correlation.

Equation (1) models a non-linear relationship of forecast dispersions across time. This curvilinear trend model allows a levelling off or accelerating of the change in uncertainty. If, over time, agents find it easier (harder) to forecast, forecasting uncertainty declines (increases) over time and we expect a negative (positive) coefficient (τ_i) on the trend variable. Forecasting

[4] For example, while the march towards openness begins famously with inflation targeting and the publication of the *Inflation Report* in November 1992, 1994 saw the introduction of a regular schedule of meetings between the Chancellor and Governor and the publication of minutes of their meetings. May 1997 saw the Bank of England given operational independence and a shortening in the lag between decision meetings and the publication of minutes. Wadhwani (2001) argues that 1999 marks another significant date since by then agents have had sufficient time to 'learn' how the MPC works.

uncertainty may show (a) a decelerating positive slope ($\tau_i > 0, \varphi_i < 0$), (b) an accelerating positive slope ($\tau_i > 0, \varphi_i > 0$), (c) a decelerating negative slope ($\tau_i < 0, \varphi_i > 0$), or (d) an accelerating negative slope ($\tau_i < 0, \varphi_i < 0$).

The curvilinear trend model is a useful tool to test how the changes in the conduct of monetary policy have affected agents' confidence over time. If the increase in transparency enhanced agents' understanding and confidence, we would expect that uncertainty fell over time ($\tau_i \prec 0$) . To any achievements in policymaking, the passage of time is inevitably relevant since, for any given regime, time enables agents to learn by experience. Whadhwani (2001, p.355) suggests that agents' required two years (1997-99) to 'learn' about the reactions of the MPC. And it is a general theme of Thornton (2003) that what *really* improves policy outcomes is the stability of regime combined with consistent behaviour. In these circumstances, time alone will ensure that agents understand how the monetary authority behaves, without any of the currently fashionable 'transparency characteristics'. If learning is important, it may even be that over time, agents' uncertainty falls more rapidly ($\tau_i \prec 0, \varphi_i \prec 0$) .

We turn to the empirical results and begin with those for Germany first (see Table 2 below)[5]. As in the case of the Bank of England, we also expect a negative trend coefficient and, if agents' forecast uncertainty falls more rapidly over time, the parameter φ_i should also be negative, if the Bundesbank/ECB were better understood by market participants over time. Particularly at the early period of the ECB, market participants seemed surprised about either ECB's policy move or the lack of it, as for instance repeatedly reported by the *Financial Times*. Thus, an additional interesting hypothesis to test for the Bundesbank/ECB regime is whether agents may have become more uncertain about their monetary policy predictions in the later, the ECB period. If the hypothesis were correct that ECB policy has increased agents' forecasting uncertainty, we would expect the following estimation results of equation (1): Either, if τ_i were negative over the entire sample period (implying that over time agents have become more confident in forecasting monetary policy) and φ_i should be positive so that the falling trend flattens out as time goes on ('getting better but more slowly'); or, if τ_i were positive, then φ_i should also be positive, indicating an accelerating rise in private agents' forecasting uncertainty ('getting worse and more quickly').

[5] All estimations that involve model (1) use orthogonal trends in order to avoid correlation between the explanatory trend variables.

The estimation results of short-term forecast uncertainty (3mRange(BB/ECB)and 3mSD(BB/ECB)) indicate that neither of the uncertainty measures changes over time. Not only has the regime switch from Bundesbank to ECB not affected *average* monetary policy anticipation (see for instance Ross, 2002; Biefang-Frisancho Mariscal and Howells, 2006; Coppell and Connolly, 2003; to mention a few), it also did not affect agents' short-term forecasting unanimity. The picture is somewhat different when we look at the results of annual forecasting uncertainty (annualRange(BB/ECB) and annualSD(BB/ECB)). Throughout the sample period, agents' forecast dispersion has increased, but also here, there is no sign of rising uncertainty under the ECB compared to the Bundesbank regime.

The short-term forecast dispersion results under the Bank of England (3mRange(BoE) and 3mSD(BoE)), show that agents' confidence has increased over time $(\tau_i < 0)$, which may be attributed to the incremental increase in Bank of England monetary transparency. Even though, market participants' learning and central bank's need to establishing monetary policy credibility may be important, there is no evidence here over this sample period $(\varphi_i = 0)$. [6] The results on annual forecasting uncertainty (annualRange(BoE) and annualSD(BoE))are more difficult to interpret in relation to our discussion so far. The downward trend in uncertainty is reversed by mid-1996. We return to this issue at a later stage.

[6] We pointed out earlier that the sample begins in 1994. As shown in Haldane and Read (2000) and also in Biefang-Frisancho Mariscal and Howells (2007), market agents' policy anticipation improved significantly since inflation targeting was introduced in 1992. This may imply that the learning process was at an end by 1994 and is therefore not picked up by our estimations.

Table 2:
Quarterly and annual forecasting volatility of money market rates under BB/ECB and BoE

Variable	α_i	β_i	τ_i	φ_i	R^2 $[\bar{R}^2]$	LM(2)
3mRange(BB/ECB)	0.174* (5.77)	0.498* (5.67)	-0.0002 (-0.59)	0.0000 (0.60)	0.26 [0.24]	8.61* [0.014]
3mSD(BB/ECB)	0.081* (5.89)	0.469* (4.99)	-0.000 (-0.03)	0.0000 (0.90)	0.26 [0.24]	1.78 [0.410]
annualRange(BB/ECB)	0.270* (5.84)	0.550* (7.37)	-0.0008 (-1.48)	0.00005* (2.01)	0.55 [0.54]	8.95* [0.011]
annualSD(BB/ECB)	0.107* (5.05)	0.585* (7.43)	-0.003 (-1.84)	0.00002* (2.63)	0.59 [0.59]	6.54* [0.004]
3mRange(BoE)	0.359* (9.09)	0.269* (3.90)	-0.00147* (-3.65)	-0.0000 (-0.20)	0.26 [0.24]	0.32 [0.850]
3mSD(BoE)	0.125* (5.29)	0.422* (3.88)	-0.0004* (-2.07)	0.0000 (0.07)	0.26 [0.25]	4.88 [0.087]
annualRange(BoE)	0.607* (5.87)	0.430* (5.43)	-0.004* (-3.98)	0.000063* (2.89)	0.61 [0.61]	2.66 [0.264]
annualSD(BoE)	0.181* (5.47)	0.586* (8.47)	-0.00108* (-3.83)	0.00002* (3.12)	0.75 [0.74]	2.26 [0.322]

Note: All equations are estimated by OLS and the t-values in brackets are calculated on the basis of Newy-West adjusted variances and covariances. LM(2) is the Lagrange multiplier test for serial correlation of order 2. In square brackets in the last column are the probability levels '*' indicate that coefficients or tests are significant at the 5% level of less.

Taking the results together and including those of Table 1, we find that even though agents' average uncertainty has been comparatively lower under Bundesbank/ECB regime, the absence of the decline in short-term forecasting uncertainty (in comparison to agents facing Bank of England monetary policy) may, at least to some degree, be responsible for why the Bank of England is perceived as being more predictable. Also, the continuous rise in long-term forecast uncertainty under Bundesbank/ECB and the at least initial fall in uncertainty under the Bank of England, may explain agents' perception on the difference in transparency of both banks.

3 Explaining short-term interest rate uncertainty

The change in uncertainty over forecasting market interest rates in both countries over time could have a number of possible explanations. However, if there is a consensus that deviations of current from target inflation and changes in the output gap are important inputs into central bank reaction functions, then one obvious hypothesis that we must test is that agents have become more (or less) certain in their inflation and GDP forecasts too. Thinking in terms of a reaction function, the point here is that while agents may be reasonably knowledgeable about the magnitude of the coefficients, they may become more or less certain about the magnitudes to which the coefficients apply. In other words, even if the central bank reaction function is well understood and known, it is possible that agents find it difficult to forecast relevant macroeconomic variables. If this is the case, then even for given and 'known' coefficients in the reaction function, the forecasting uncertainty of money market rates varies with the forecasting uncertainty of, say, the inflation rate or the relationship of output to trend.[7] The uncertainty about future inflation (or economic growth), will then show up in a greater spread of the forecasts of money market rates.

Agents' uncertainty about macroeconomic development may change either because the economy moves away from a more stable state, or there is a turn in the business cycle, or the economy experiences shocks, to give just a few examples. Also the establishment of new, major institutions may initially cause greater uncertainty for agents until these institutions have been established for some years or so.[8]

The latter may be particularly relevant for the estimations under Bundesbank/ECB. EMU has been a new phenomenon and in this section we want to analyse whether agents found it more difficult in these circumstances to predict macroeconomic variables as inflation and GDP growth. Particularly at the beginning of EMU, it may be more difficult for agents to predict the macroeconomy of individual countries in the new area given the uncertainty over the true degree of convergence of individual economies and how they would react to the 'one-size-fits-all' level of interest rates. Since the prediction of central bank policy moves depends to some extent on agents being able to forecast movements in the variables entering the bank's reaction function, then increasing difficulty in forecasting these variables would make agents less confident in their anticipation of policy moves, especially since there is feedback to these variables from the authorities' policy decisions and since because of the new regime the nature of the feedback has

[7] Mervyn King might be right that in an ideal policy world the 'news' would be in the movement of the macroeconomic variables but if that news is hard to extract, monetary policy could still have its exciting moments.
[8] See again Wadhwani (2002, p.355). Also, Bean (2005 pp.86-88) for example, in commenting upon the greater economic stability with which policymakers have been confronted in recent years, suggests that part of the explanation is an improvement in policymaking itself. This suggests a sort of virtuous circle whereby (we can begin anywhere) improved policymaking improves stability which makes it easier for agents to anticipate the path of macro-variables and the reaction of the authorities for whom policymaking then becomes easier.

become uncertain. Furthermore, this injection of uncertainty into the way in which *current* interest rate decisions affect the future path of relevant macro variables will increase with the forecast horizon. Current interest rate decisions may have little effect on relevant magnitudes three months hence, but will very likely have some impact in a year's time.

In the following sections, we estimate agents' uncertainty regarding inflation and GDP growth.[9] Finally, we test whether inflation uncertainty explains uncertainty in market interest rates.

For both countries, we use monthly data for inflation and real GDP growth, each predicted one year ahead (only). Again, we calculate the forecast range and use the reported standard deviation to measure macroeconomic forecast uncertainty. For the UK, the sample period is from January 1994 until May 2004. For Germany, the sample period for the one-year-ahead inflation forecast range is from January 1994 until May 2004 and for the one-year-ahead GDP growth range it is from June 1994 until May 2004. Forecasts for GDP growth refer to unified Germany throughout. Inflation forecasts are reported for West Germany until September 1997, only. Table 3 shows the basic descriptive statistics of the data.

Table 3:
Descriptive statistics of macro variable dispersions under BoE and BB/ECB regimes

	mean	*median*	*min*	*max*	*SD*
Inflationrange(G)	0.653	0.6	0.3	1.3	0.19
Inflationrange(UK)	1.095	0.8	0.4	3.3	0.67
InflationSD(G)	0.270	0.3	0.1	0.5	0.08
InflationSD(UK)	0.423	0.3	0.2	1.2	0.21
GDPRange(G)	0.804	0.8	0.4	1.5	0.2
GDPRange(UK)	1.094	1.1	0.4	1.8	0.35
GDPSD(G)	0.329	0.3	0.2	0.6	0.08
GDPSD(UK)	0.470	0.5	0.2	0.8	0.13

In all cases (except for one), average forecast dispersions (mean and median) of the two macroeconomic variables are lower under Bundesbank/ECB. Also, average variation and range of forecast dispersion are higher under the Bank of England regime, so that overall, macroeconomic uncertainty is on average higher in the UK than in Germany. The lower macroeconomic average forecasting uncertainty in Germany may have been favourable to a tendency for lower interest forecasting uncertainty than otherwise. Likewise, the higher average macroeconomic forecasting

[9] The source is as before various issues of *Consensus Forecasting*.

uncertainty for the UK may have overshadowed some of the effects of greater transparency efforts intended by the Bank of England.

As before, we test for the degree of forecast uncertainty over time in order to be able to relate the results of the behaviour of the macroeconomic forecasting dispersion over time to that of the interest rate forecasting dispersion. We use equation (1) above, replacing the dependent variable therein by the one-year-ahead inflation and one-year-ahead real GDP growth forecasting range or standard deviation, respectively.[10]

The results of the estimations of equation (1) are shown in Table 4 below:

Table 4: Quarterly and annual forecasting volatility of the inflation rate and GDP growth under BB/ECB and BoE, based on modified equation (1)

Variable	α_i	β_i	τ_i	φ_i	R^2 [$\bar{R}^2$]	LM(2)
Inflationrange(G)	0.360* (6.11)	0.407* (4.10)	0.001896* (5.11)	0.0000206* (1.99)	0.52 [0.51]	5.24 [0.073]
inflationSD(G)	0.161* (7.36)	0.353* (4.25)	0.000883* (3.96)	0.0000103* (2.20)	0.51 [0.50]	3.62 [0.164]
GDPRange(G)	0.459* (7.65)	0.379* (4.55)	-0.0002 (-0.44)	0.0000 (1.50)	0.20 [0.17]	2.58 [0.323]
GDPSD(G)	0.151* (7.03)	0.497* (7.44)	-0.0002 (-107)	0.00001* (1.96)	0.32 [0.30]	0.65 [0.722]
Inflationrange(UK)	0.359* (4.48)	0.516* (5.51)	-0.00681* (-4.80)	0.000121* (4.63)	0.89 0.89	4.77 [0.092]
inflationSD(UK)	0.149* (4.51)	0.511* (5.24)	-0.001981* (-3.73)	0.0000413* (3.84)	0.87 0.87	2.84 [0.242]
GDPRange(UK)	0.385* (5.16)	0.608* (8.04)	-0.00274* (-3.90)	0.0000327* (2.30)	0.72 0.71	0.179 [0.915]
GDPSD(UK)	0.168* (4.30)	0.582* (6.48)	0.00006 (0.22)	0.0000223* (3.25)	0.49 0.47	4.81 [0.090]

Note: All equations are estimated by OLS and the t-values in brackets are calculated on the basis of Newy-West adjusted variances and covariances. LM(2) is the Lagrange multiplier test for serial correlation of order 2. In the last column in square brackets are the probability levels '*' indicate that coefficients and tests are significant at the 5% level of less.

[10] In the German case, we included a further dummy to account for a change in the reporting of the inflation data from West Germany to Germany. It was insignificant and is not reported here.

We first turn to the results of GDP growth forecast dispersion in both countries: in the German case, there is no evidence that GDP growth forecasting uncertainty changes over time. Contrary to this, there is, on balance an upward trend in UK forecasting uncertainty, albeit with an initial fall at the beginning of the sample period. More illuminating are the results on inflation forecast dispersion. The German estimation results show that inflation forecast dispersion rises throughout the sample period, at an accelerating speed. The latter may indicate that the switch to the EMU has increased agents uncertainty over inflation. Also, the behaviour of inflation forecast dispersion matches in direction (although not in intensity) with the continuous rise in long-run interest forecast dispersion as shown in Table 2. For the UK the results are different. Initially, there is a fall in inflation forecast dispersion, a trend, which is reversed in the first half of 1996. This is at approximately the same time as we found a rise in interbank rate uncertainty in the UK. For both, the UK and Germany, therefore, there does appear to be some association between increasing uncertainty about future interest rates and increasing uncertainty about the future path of inflation.

The second part of this section is concerned with testing for the effect of inflation uncertainty on market rate uncertainty. For both countries, we only replace the trends in the regression equations by volatility of inflation and the dependent variables are the one-year-ahead interest rate forecast dispersions. Table 5 below presents the results.

Table 5: Annual forecasting range and standard deviation of the money market rates and inflation volatility for Germany and the UK

Variable	α_i	β_i	c_1	R^2 [$\bar{R}^2$]	LM(2)
annualSD(G)	0.066* (2.63)	0.737* (10.41)	0.058 (1.07)	0.56 [0.56]	11.16* [0.004]
annualRange(G)	0.189* (2.90)	0.706* (9.20)	0.118 (0.69)	0.51 [0.50]	13.16* [0.001]
annualSD(UK)	0.119* (5.28)	0.635* (10.54)	0.060* (4.25)	0.75 [0.74]	7.76* [0.021]
annualRange(UK)	0.419* (5.56)	0.435* (4.62)	0.242* (3.95)	0.62 [0.61]	2.92 [0.318]

Note: All equations are estimated by OLS and the t-values in brackets are calculated on the basis of Newy-West adjusted variances and covariances. LM(2) is the Lagrange multiplier test for serial correlation of order 2. In square brackets are the probability levels '*' indicate that coefficients are significant at the 5% level of less. The coefficient c_1 refers to the variable inflation forecast volatility.

There is no evidence for Germany that one-year-ahead euro-DM uncertainty is affected by dispersion of views about inflation. This result is perhaps not that surprising. Policy rates are set by the ECB and the relevant inflation rate for ECB policy purposes is based on the *Harmonised Index of Consumer Prices* for the euro area.[11] In other words, we may be looking at the 'wrong' inflation rate. However, when we estimated over the shorter period, before EMU, the range of inflation forecasts was not a significant explanatory variable for interest rate forecast dispersion. We therefore may conclude that the rise in money market uncertainty may be due to the regime change and with it agents' difficulty to confidently forecast ECB policy.

For the UK, the results are clear: inflation uncertainty increases the uncertainty of one-year-ahead forecasts of interest rates. In other words, the rise in inflation uncertainty (see Table 4) increases monetary policy uncertainty. The interesting question is why should this uncertainty have surfaced in 1996. One year later and one might have pointed to the independence of the Bank of England and a partially new operating regime, but this came generally as a surprise and so it is difficult to argue that the uncertainty reflects an expectation of a regime change.

Some evidence is provided in the Bank of England's *Inflation Reports* for 1996. In each quarterly issue, section 6 discusses 'prospects for inflation'. This discussion centres around the famous fan charts showing the forecast path of inflation as a probability distribution. It is clear from a comparison of the charts from one issue to the next that the 'fan' becomes more dispersed. This increase in the uncertainty of its own forecasts is acknowledged by the Bank in the November *Report* (Bank, 1996b p.44). Moreover, beginning in February 1996, section 6 of the *Report* included a subsection titled 'other inflation projections' wherein the Bank commented on other forecasters' projections, both as regards their median values and the dispersion. In the August issue the Bank comments: 'Unusually, the spread of views for 1997Q4 has not narrowed…the interquartile range has widened slightly to 2.5%-3.3%' (Bank, 1996a, p.46). The term 'unusually' is used because the Bank is referring specifically to the behaviour of one year ahead forecasts; the increased dispersion of view is absent at shorter horizons.

In so far as an explanation is offered, it centres on the behaviour of the exchange rate, which had become very volatile, appreciating by 8 per cent between the August and November *Reports* alone (Bank, 1996b pp. 41, 45). It is interesting to note that the standard deviation of monthly data for the sterling effective exchange rate between the introduction of inflation targeting in November 1992 and the middle of 1996 is just 1.8; from late 1996 to the end of 2000, a period of roughly comparable length, the standard deviation is 8.05.[12] It is hard to escape the conclusion

[11] *Consensus Forecasts* has published euro area statistics only since January 2003.
[12] Calculated from the series XUMABK on the Bank of England's database.

that agents had become familiar with the Bank's post-inflation targeting reaction function and its coefficients, and had become reasonably confident in handling the feedback from interest rate decisions to the inflation and output inputs, all in a period of relative exchange rate stability. This ends quite suddenly in 1996. From then on, it becomes much more difficult to forecast the future path of inflation, at least at horizons like a year or more, and thus of the Bank's likely reaction at similar horizons. Such uncertainty may or may not have been supplemented by the reforms in May 1997, but it was already well-established by then.

5. Conclusion

If agents find it easier to anticipate future central bank policy moves, it is not only expected that, on average, the policy surprise on the day of the policy announcement declines, but we should also expect that the cross sectional distribution of interest rate forecast dispersion becomes narrower.

Cross sectional forecast dispersion are used as additional evidence to shed some light on the apparent divergence in agents' perception and ability to predict both, Bundesbank/ECB and Bank of England policy rate changes. If Bundesbank/ECB policy were more difficult to predict than Bank of England's, we expect a greater dispersion of interest rate forecasts of the former than the latter. The estimation results show that there is an obvious decline in agents' (short-term) interest forecast uncertainty under the Bank of England regime, while nothing has changed under the Bundesbank/ECB. Furthermore, under Bundesbank/ECB, long-term forecast uncertainty has risen throughout the sample period, while under Bank of England a declining trend has been reversed. Taking the results together, interest forecast uncertainty has fallen more under BoE than under BB/ECB.

The fall (lack of change) in (short-term) interest forecast uncertainty and the eventual rise (the continuous rise) in (long-term) forecast uncertainty under Band of England and Bundesbank/ECB, respectively, may be due to changes in inflation and GDP growth forecast uncertainty. Interest rate forecast uncertainty may rise (fall) due to a rise (fall) macroeconomic uncertainty. For instance, if macroeconomic uncertainty has risen, this may explain for why the fall in interest forecast uncertainty was either lower than one might expect or was actually rising. We find for Germany no obvious change in GDP growth forecast dispersion, while there is on balance, in the UK, a rising tend (albeit falling in the first half of the sample period. Inflation uncertainty has been rising over the entire sample period for Germany, while the UK shows a spell of a fall that is later on reversed. The similarity of the movement of long-term interest and inflation forecast dispersions in both countries suggested that inflation and interest rate forecast uncertainty

may be related to each other. It was tested whether the change in inflation forecast dispersion explained long-term interest rate forecast dispersion. It was found that this is only so for the UK, where higher inflation uncertainty explains greater interest forecast uncertainty.

In short, we think we have gone some way to resolving the apparent paradox we highlighted earlier, whereby agents appear to be able to read policy quite well and yet report themselves as uncertain about what central banks (especially the Bundesbank and now the ECB) are doing. Agents' greater difficulty in understanding Bundesbank/ECB policy as expressed in surveys, may reflect their higher degree of uncertainty, as shown in the cross sectional data analysis in this paper, even though, *on average*, their decisions turn out to be often correct.

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