

# The Interest Rate Conditioning Assumption

C.A.E. Goodhart  
Financial Markets Group  
London School of Economics  
(Draft – 17<sup>th</sup> August 2005)

## I. Introduction

A central bank's forecast must contain some assumption about the likely future path for its own policy-determined short-term interest rate. Most of those central banks who have publicly reported their procedures in this respect have assumed that interest rates would remain unchanged from their present level, e.g. in Sweden, in the USA (at least most of the time) (see, for Sweden, Berg, Jansson and Vredin, 2004; and Jansson and Vredin, 2003; and for the USA, Boivin, 2004; Reifschneider, Stockton and Wilcox, 1997; and Romer and Romer, 2004). The UK was amongst this group from the first Inflation Report, at the end of 1992, until May 2004; then in August 2004 it shifted to the use of the forward short rates that are implied by the money market yield curve.<sup>1</sup>

We start by describing some of the reasons that may have lain behind this change to the form of this conditioning assumption in Section 2. We then examine how good the forecasting record of these implied forward rates has been, in Section 3. As we

---

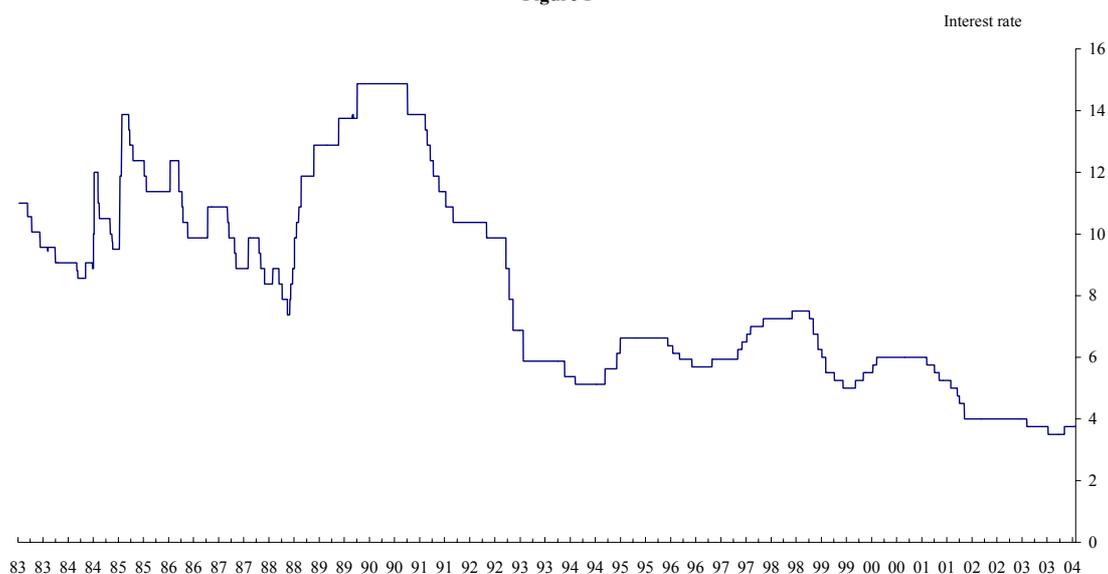
<sup>1</sup> In fact it used both conditioning assumptions for many years before 2004, but the constant interest rate assumption was given clear precedence. Since August 2004, it has continued to use both conditioning assumptions, but now the money market rate curve is given the greater emphasis, see Lomax (2005).

shall show, the root mean square errors (RMSE) of the implied forecasts are greater at horizons longer than four quarters than the previous assumption of constant interest rates. This finding, that the money market yield curve fails to forecast at all well, particularly for such longer horizons, is similar to earlier such studies for the USA (Rudebusch and Wu, 2004; also Diebold and Li, 2003; Duffee, 2002; Carriero, et al, 2003; and Rudebusch, 2002) and for Japan (D. Thornton, 2004).

This raises a number of queries. First, does this finding call into question the switch by the UK's Monetary Policy Committee (MPC) to the new conditioning assumption? There was an earlier debate in the MPC about what conditioning assumption to use for foreign exchange rates; the two main contenders were random walk, i.e. constancy, which had the better forecasting track record; or uncovered interest parity, which had more theoretical coherence. At the time, the weight of support within the MPC was roughly equally balanced, so a compromise was struck, to give half weight to both RW and UIP. Like most compromises it pleased no one much, providing neither a good forecast, nor a plausible analytical story.

Unlike the exchange rate, the historical path of the policy rate has clearly not been random walk, either since the adoption of Inflation Targeting (at the end of 1992), or of operational independence for the Bank of England (May 1997), or before these two events. Figure 1 shows this record. There are clear signs of auto-correlation, with numerous successive small steps in the same direction and few reversals of direction. This time pattern has been documented so often and so thoroughly (e.g. Sack, 1998, 2000), including by myself (for example Goodhart, 1999), that it would be superfluous to go over it again.

Figure 1



That, however, raises an even more interesting second question, which is why are the forward rates implied by the money market yield curves apparently such bad forecasts?<sup>2</sup> If the actual time path of policy rates has had a reasonably regular pattern, why is that pattern not forecast by the market? This latter question goes, however, beyond the scope of this limited exercise. It will, we hope, be the subject of our own future research. Moreover, we do not seek to discuss the econometric techniques used to extract the implied forward rates from the money market yield curves. For numerical estimates of these latter we have relied on the staff of the Bank of England,

---

<sup>2</sup> Much of the literature of the relationship between changes in policy rates and changes in money market rates has been concerned with the question whether the changes in policy rates had already been anticipated by the money market (implying transparency). In particular, the hypothesis that ‘expected’ rate changes would have no effect on money market rates, whereas unexpected changes would have strong effects, was frequently tested, and empirically supported. Recent examples of this literature include Bernhardsen and Kloster (2002), Coppel and Connolly (2003), Haldane and Read (2000), Kuttner (2001), Lildholt and Wetherilt (2004), Perez-Quiros and Sicilia (2002), Poole, Rasche and Thornton (2002), and Mariscal and Howells (2005).

Our concern here is different, and relates to a much lower frequency. Here we ask not whether money markets yesterday correctly anticipated today’s policy change, but whether the implicit one month interest rate forecast for this month made  $t$  quarters before was a good predictor of this month’s policy rate, where  $t$  runs from 1 to 8.

and we are most grateful to them, notably to Mark Allan and Matthew Hurd, for providing us with these data.

Section 4 sets out some directions for future research, including the above, and concludes.

## II. Arguments over the Choice of Conditioning Assumption

The strongest single argument against the assumption of a constant future nominal short-term interest rate path is that this is often not what most people expect to happen. The money market yield curve is only occasionally approximately flat out to the forecast horizon, which for the purpose of this exercise we take to be eight quarters ahead.<sup>3</sup> Perhaps even more important, there have been periods when a central bank has been clearly signalling that it expected future changes in its policy-determined interest rates. The expectation of a 'measured' rate of increase in US interest rates in 2004/05 is a case in point. But such signalling was also apparent in the UK in early 2004. It is, to say the least, inconsistent to have the central bank give one message in words, and then to base its forecast on quite a different assumption.

The main alternative in the academic literature, which several economists have been advocating (e.g. Svensson, 2003, 2004 and Woodford, 2004), was to base the conditioning assumption on a specific non-constant forecast made by the Bank, or by its Monetary Policy Committee (MPC). But this also has its drawbacks. While an MPC might be quite willing to agree and to endorse a general direction of likely

future change, (as in the FOMC 'bias' reports), it would generally be much less happy to commit itself to a specific, quantitative path, although this is what has been done in New Zealand, and its relatively untroubled acceptance there influenced Svensson, who wrote a Report on their procedures, (Svensson, 2001).

In New Zealand the responsibility for hitting the Inflation Target rests on the Governor of the Reserve Bank personally. So he, (as yet there have been no female Governors there), can also decide upon the form and nature of the published forecast, including the conditioning assumptions. It is difficult enough for a Committee to agree on the selection of the policy rate to hold until the next meeting, when the range of feasible and sensible options is quite limited, (and that range has been greatly reduced by the implicit, but now general, convention that interest rate changes should always be in multiples of 25 basis points); it would be a quantum jump more difficult to get such a committee to agree on a single path for the next n quarters, when the potential range of feasible/sensible options widens dramatically, also see Mishkin (2004).

Assuming that an MPC could agree, or find a procedure for agreeing, on such a forecast for the time path of future interest rates, (Svensson has suggested taking the median of individually decided preferred paths), this would have, almost certainly, to be published. In view of the current ethos of transparency, it would hardly be acceptable to state that the forecast was based on a non-zero conditioning assumption, but that the public is not to be told what this was, (though on some occasions the Fed Staff are believed to have based their Blue Book forecasts on a non-constant rate

---

<sup>3</sup> In August 2004 the MPC in the UK extended the horizon recorded in the fan charts (for inflation and

assumption without having provided any indication of that, despite being 'protected' from public inspection by the five year lag).

If an MPC's non-constant forecast was to be published, there is a widespread view, in most central banks, that it would be taken by the public as more of a commitment, and less of a rather uncertain forecast than should be the case, (though that could be mitigated by producing a fan chart of possible interest rate paths, rather than a point estimate: no doubt, though, measuring rulers and magnifying glasses would be used to extract the central tendency). Once there was a published central tendency, then this might easily influence the private sector's own forecasts more than its own inherent uncertainty warranted, along lines analysed by Morris and Shin (1998, 2002, 2004).<sup>4</sup> Likewise when new, and unpredicted, events occurred, and made the MPC want to adjust the prior forecast path for interest rates, this might give rise to criticisms, ranging from claims that the MPC had made forecasting errors to accusations that they had reneged on a (partial) commitment.

Lars Svensson, and some other academics, respond that this concern implies that MPCs regard participants in financial markets as unsophisticated, and incapable of understanding the concept of a conditioning assumption; moreover there were few, if any, recorded problems in New Zealand. Be that as it may, most members of MPCs have been reluctant to move to a specific forecast for a future time path for interest rates.

---

output growth) to three years, but the surrounding text tended to indicate that the two year horizon remained the chief focus of attention, again see Lomax (2005).

<sup>4</sup> There is a continuing debate between Svensson, and Morris, Shin and Tong on the necessary conditions under which transparency may, or may not, be damaging to social values. See Svensson (2005) and Morris, Shin and Tong (2005).

Caught between the lack of credibility (at least on some occasions) of a constant rate assumption, and the problems of adopting an MPC chosen time path for interest rates, the move by the UK MPC to adopt the estimated future path as estimated by the market for its conditioning assumption could be seen as a brilliant compromise that got around the worst features of both the other two alternatives. Given the normal assumptions of rational expectations and efficient markets, the market's forecast ought to be credible; yet its adoption in the forecasting procedure required no decision procedure in the MPC itself, and committed them to nothing; a master-stroke indeed. The change in procedure did not at the time cause much discussion, or elicit any criticism (that I saw). There may, however, be some drawbacks to this new approach, which need to be considered. One is the dynamic implications of adopting a market forecast; a second is how far the market forecast has had a good track record.

Yet another of the criticisms raised against the constant interest rate forecast is that, if maintained too long, it would lead to Wicksellian instability. Indeed in medium run simulations at the Bank of England running much beyond the prior two-year horizon, the constant two-year rate assumption had to be linked into a Taylor-type reaction function to prevent non-sensical trends developing as the horizon extended beyond two years. But, up to the two year horizon, there did not seem to be any practical, empirical problem with this assumption.

On the other hand, the assumption of constant forward policy-determined interest rates imposed a strong discipline on the MPC that I considered (Goodhart, 2001) to be strongly beneficial. Because of the British MPC's inbuilt dislike of reporting inflation

failing to come back close to target at their focus horizon of 7/8 quarters hence, this assumption virtually forced the MPC to take immediate, and sufficient, action to counter and remove any perceived threat to inflation stability, as soon as it appeared. I have sought to document this behavioural trait in several recent papers (Goodhart 2004 and 2005). In my own view the main cause of endemic inflation in earlier decades had been the syndrome of 'too little, too late' in a context of great uncertainty, a trait which could be viewed as a version of time inconsistency. So any procedure that forced the decision-makers into prompt corrective action was to be supported and encouraged.

What will be the dynamic implications for the new market-based forecasting mechanism? It is, to say the least, an incestuous exercise. The market is primarily trying to guess what the authorities will do, and the authorities are then setting rates dependent on what the market has guessed. As Bernanke and Woodford (1997) have shown in much greater detail, such an approach can be potentially dynamically unstable.<sup>5</sup>

Clearly there are no problems when the MPC's current decision has been (largely) predicted by the market, and the resultant forecast shows inflation reverting satisfactorily to target. But what if the MPC's forecast should indicate, (given the

---

<sup>5</sup> Bernanke and Woodford concentrate primarily on circumstances when policy is conditional on the market's forecast of future inflation, e.g. raising policy rates when the market expects inflation to be above target, and vice versa. Here the problem is that if the market expects the authorities to offset shocks perfectly, then the (private sector) forecast always equals the target and reveals nothing. One option is for the authorities to aim to get back close to, but not exactly on, target, giving the private sector some forecast leeway; and then for the authorities to adjust the policy rate sharply in response to small shifts in the deviation of the market's forecast inflation from target. But this could lead to instability when the market's forecasts were noisy. A better option, however, would be for the authorities to gather, at the same time, market forecasts not only of inflation, but also of future policy rates and of output. With sufficient information on a range of private sector forecasts, the authorities can then in principle extract all their (private) information.

current decision and the implied money market yield curve), that inflation would still be tending to over (under) shoot the target, especially, but not only, at the main focus horizon? Then, emphasize the Bank economists, the publication of that deviation would influence expectations of market participants in the desired direction, and lead to an appropriate rise (fall) in future expected rates, and hence in longer term interest rates. Then, movements in longer term interest rates will affect the economy more widely. Thus, goes the argument, the Bank now has effectively two instruments, its current interest rate decision, and its separate ability to influence expected future interest rates.<sup>6</sup> The latter is not, however, an instrument that the Bank can vary at will. If the Bank's forecast was ever suspected of being manipulated to achieve a market effect, it would lose all credibility. The Bank is forced to give its best, most truthful, forecast.

That is an argument that I accept, up to a point. If the resulting deviation of inflation from target, as shown in the Inflation Report, is large, especially at main focus target of 7/8 quarters hence, and/or continuously worsening, it would raise public queries why no action had already been taken to deal with the perceived in(de)flationary threat. While it may be possible to give answers to this, the extent to which the MPC

---

<sup>6</sup> This is closely similar to the analysis in Gurkaynak, et al, 2005, in which they state,

“Do central bank actions speak louder than words? We find that the answer to this question is a qualified “no.” In particular, we find that viewing the effects of FOMC announcements on financial markets as driven by a single factor – changes in the federal funds rate target – is inadequate. Instead, we find that a second policy factor – one not associated with the current federal funds rate decision of the FOMC but instead with statements that it releases – accounted for more than three-fourths of the explainable variation in the movements of five- and ten-year Treasury yields around FOMC meetings.

We emphasize that our findings do not imply that FOMC statements represent an *independent* policy tool. In particular, FOMC statements likely exert their effects on financial markets through their influence on financial market expectations of *future* policy actions. Viewed in this light, our results do not indicate that policy actions are secondary so much as that their influence comes earlier – when investors build in expectations of those actions in response to

has been prepared to allow forecast inflation to deviate from target, especially at the main focus target of around 7/8 quarters, has been historically small.

What happens, however, if the MPC's current decision surprises the market, in the sense that it has not (or only partly) been previously expected? As Svensson and Woodford emphasize, e.g. Woodford (2005), it is not the overnight or one month interest rate that mainly affects the economy, but the longer term expected time path of interest rates. Surely any such surprise will affect future expected interest rates. The Bank forecasters will have to build into their forecasts some market reaction to that surprise, in order to guide the MPC whether enough has been done.

As Woodford (2005) notes:-

“Another problem with the current procedure of the Bank of England is that it is unclear how the MPC is intended to determine the correct current repo rate in the event that the interest-rate path expected by the markets is judged to imply projections inconsistent with the Bank's target criterion. Would an attempt be made to determine the current repo rate that would lead to an acceptable projection, under the assumption that *the path of the repo rate after the current month would follow the path anticipated by the markets?* This would typically require an extreme adjustment of the current repo rate, as a change in the repo rate for only one month would have to change the path of inflation over the following two years by enough to get the projected inflation rate two years in the future on track. A more sensible approach would surely involve adjusting the entire path of interest rates to one that the MPC would view as more sound, rather than acting as if the committee expected itself to behave in the future in the way currently anticipated by the markets, even though it was planning to depart substantially from the markets' expectation in the short run. But in this case, projections would have to be produced on the basis of an assumption about future policy other than the one corresponding to market expectations. The idea that the MPC would be able to avoid taking a stand (at least in its internal deliberations) on a reasonable future path of interest rates, by insisting on using the markets' forecast in its projections, is not tenable.”

---

FOMC statements (and perhaps other events, such as speeches and testimony by FOMC members).”

Most often, however, in practice markets can, and do, anticipate current policy decisions, see the references in footnote 2, especially Lildholdt and Wetherilt (2004) for the UK. So this concern may be viewed as largely hypothetical. Moreover, if the problem was perceived as serious, then it could be largely met by also publicly revealing the adjustments made by the forecasters to the money market yield curve to take account of estimated reactions.

Alternatively, and even simpler, since the Inflation Forecast is not published for a number of days after the MPC decision has been made, the forecasters could base their ex post forecast on the ex post reactions of the market to that decision.

Admittedly the choice of date(s) at which to measure the ex post reaction would be arbitrary, but then so too is the choice of dates on which to estimate the ex ante future path of rates. Moreover, should the market's reaction not be what the Bank/MPC wanted, or expected, then the same argument as before, that the resulting published deviation of inflation from target should help to guide the market's expectation revisions, should presumably hold.

Even if the forecasters made no adjustments to take account of the current 'surprise' decisions, so long as that was publicly known, then the published time path of inflation in the Inflation Report would give the market some idea of how the Bank expected that they should adjust their expectations; that is if the current decision, followed by an unchanged path of future interest rates, led to inflation overshooting the target in the IR, then the market would be being guided to revise upwards its expected future time path for interest rates.

A current concern is that few commentators seem to understand exactly on what basis the money market yield curve used in the Inflation Report forecast has been constructed. Indeed, I have been led to understand that the ex ante forecast, unadjusted for the surprise element in the interest rate decision, continues to be used. While this is reasonable, so long as the surprise in the decision was minor, but what if it was not? Perhaps on such occasion, the Bank/MPC would give some additional guidance?

But, in any case, and as earlier noted, there are limits to the extent of such ‘guidance’ that the Bank can give by publishing a future deviation of inflation from target. In particular, a combination of a current surprise rise (fall) in the policy rate, (perhaps to influence a current asset price boom/bust), together with a future forecast (mean) under (over) shoot of inflation from target would be hard (but not impossible) to justify to the general public.

So, one of the problems is that uncertainty about the market’s reactions to surprises, and the market’s current uncertainty about how the Bank/MPC would take account of that, adds noise to the forecasting exercise. More generally, noise in future interest rate expectations, or errors in attempting to extract such forecasts from the yield curve, would then affect the MPC’s ex ante forecasts of inflation and output and hence influence current policy rate decisions. If such implied forward rates were noisy, (and some evidence on this will be presented in Section III), it could inject noise into the policy rate decision.

Quite how serious these potential problems might ever become, or, if they were perceived as serious, what steps might be taken in mitigation, is an issue that is beyond the scope or competence of this note. My gut feeling is that they probably will not be that serious in practice, but it does need careful watching. Be that as it may, I hope to have demonstrated that the UK MPC's new procedures on this front are not without their own inherent problems.

### III. How Good a Predictor are the Implied Forward Rates from the Money Market Curves?

The more accurate the conditioning assumption for interest rates, the more likely the MPC's policy decision is likely to be correct. Thus some part of the case for switching from a constant interest rate path to a money market yield curve implied path should presumably rest on the greater success rate in forecasting of the latter. Given the prior auto-correlated path of policy rates, and in a context of rational expectations and efficient markets, the normal expectation should be that the implied rates from the yield curve should out-perform a constant rate assumption, in terms of forecasting accuracy, and probably by a large distance. But no such test exercise has, to my knowledge, been published in the UK. Moreover, the earlier references to the poor forecasting performance of money market yield curves as predictors in other countries suggests that this horse race may be tighter than one might have expected. Anyhow this is what I set out to examine.

The Bank publishes on its website a time series of UK yield curves that are updated daily (the series starts in 1979) along with explanatory documentation.

<http://213.225.136.206/statistics/yieldcurve/main.htm>

There are several files on this page - those corresponding to the general technique used in the market rate forecast up to and including August 2004 and published in the Inflation Report as table 6A are found in the spreadsheets under the heading "Government liability yield curve - Nominal."

Within these spreadsheets the data can be found on the sheet marked "nominal fwds, short end". These data are in a monthly format. This difference in time periods leads to some difficulties comparing it to the table containing the conditioning assumption used in the forecast and published in section 6 of the IR which is in a quarterly average concept.

Besides the yield curve derived from short-dated government liabilities, there is a second money market yield curve from which the Bank has also derived implied short-term forward rates, and this is based on the Libor yield curve. We used both sets of money market yield curves in the empirical exercises here.

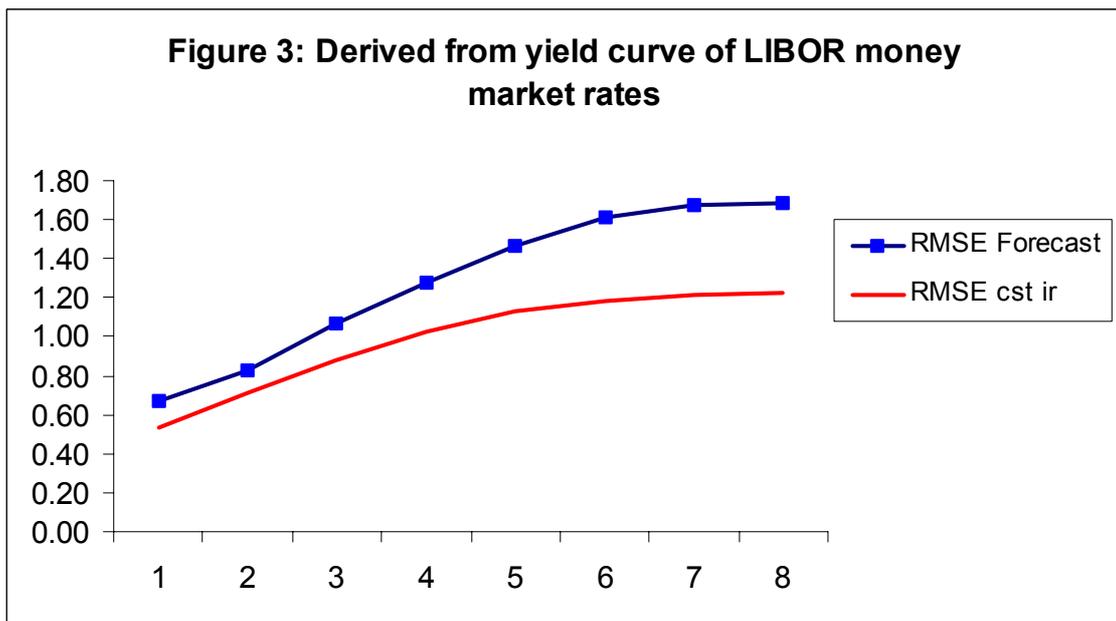
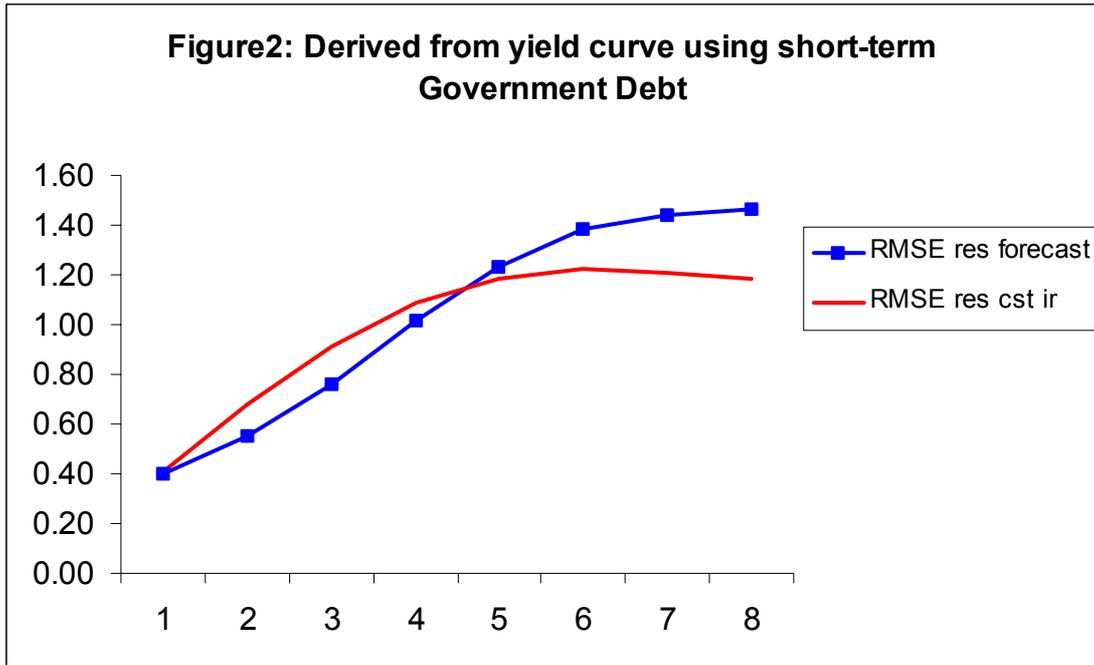
Our concern was how well the money market yield curve implied forward rates would forecast. The MPC's forecasts are done four times a year, and published in February, May, August and November, so we utilised the implied one-month forward rate at these monthly occasions (and ignored the rest). That is to say we took the implied one quarter forecast for, say, May 1995 to be the implied one monthly forecast for May 1995 made in February 1995, the second quarter ahead forecast for May 1995 to

be the implied one monthly forecast for May 1995 made in November 1994, and so on.

We did not seek to extract the implied one monthly forecast from the two yield curves ourselves. They were supplied to us by the Bank, for which we are most grateful.

There are manifold problems in this exercise, relating to possibly time-varying liquidity/risk premia, but we have no competence to comment on that, and we have no criticisms to make of the Bank's techniques. We started our exercise from 1992 Q4, because that is when the Inflation Report began, and also enables us to examine both the government and the Libor implied short forward rates.

Our first exercise was to compare the RMSEs of basing the forecast for the policy rate on (one of the two) money market yield curves, as compared to a no change assumption. These are shown in Figures 2 and 3 for the government and Libor yield curves respectively. In the government yield curve example, the RMSE of the implied forward rate lies below that of the constant rate, (implying some real forecasting ability) out to about 4 quarters hence (one year), but thereafter lies above (is worse than) the constant rate assumption.



In the Libor case, the RMSE of the implied forecast lies above that of the constant rate assumption throughout, but this is almost certainly because the Libor yield curve is predicting future Libor short rates, and this will incorporate a (near-constant?) risk premium. The forecasters should be able to adjust for that. The more important point

is that the relative curvature of the forecasts is the same as for the government yield curve, with the implied forecasts worsening relative to the constant rate assumption as the horizon lengthens.

The conclusion that I draw tentatively from this is that, in so far as the criterion under discussion is solely that of forecasting accuracy, then there may be a case for using the money market yield curve implied rates at short horizons, but no such case exists at longer horizons. If the main focus of forecasting is, as I believe it to be, about 7/8 quarters hence, then, on this criterion taken by itself, there was no real case for making the shift in conditioning assumption.

This is a strong, perhaps surprisingly strong, critique of the inherent forecasting capacities of the market. So we turned to regression analysis to try to examine what might have caused this. We first tested the order of integration of both actual interest rates, and of the implied forward forecasts of interest rates for their order. Over our data period, 1992 Q4 to 2004 Q4, both the actuals and the forecasts trended (gently) downwards, and were I(1). We then tested for cointegration between the actuals and the forecasts, and found that they were all cointegrated, and that relationship was very close to +1, -1 in all cases.

If the forecasters had some private knowledge (signal) of where interest rates were headed, then a deviation of actual from forecast in any one quarter – perhaps because of a faster, or slower, adjustment in the actuals than predicted – would lead to actuals moving back towards forecast in the next quarter. Whereas if the forecasters had no

significant private knowledge, then one would expect the next forecast to adjust to the (unexpected) move in the actuals.

So we ran Vector Error Correction Estimates of the simultaneous equation system, where  $R_t$  is the actual policy rate in the forecast month in each quarter,  $F_{t,t+i}$  is the one month rate forecast for that month in that quarter as forecast  $i$  quarters previously,  $G$ ,  $LI$  are the one month forecasts derived from the government debt/Libor yield curves respectively, and  $D$  is the first difference operator; so  $DFG_{t,t+1}$  is the first difference in the implicit one month forecasts, made a quarter previously, taken from the government debt series, and  $L$  is the lag operator. Anyhow we ran equations of the form:-

$$DR = L(DR) + L(DF) + (ECM)$$

for both  $G$  and  $LI$ , and trying the forecasts made 1, 2 and 4 quarters hence. We experimented with lag lengths of two and four; the longer lag system generally fit better and is the only one shown in Table 1 below. The coefficients on the Error Correction Mechanism show that in no case did the actual policy rate adjust significantly in response to a deviation between actual and predicted, whereas in three, out of six, cases the forecast did.

**Table 1**  
**Vector Error Correction**

	Error Correction Mechanism		Other Lags		Error Correction Mechanism		Other Lags	
	DR	DFG	DR	DFG	DR	DFLI	DR	DFLI
$F_{t,t+1}$	0.56 (0.42)	3.17 (2.20)+	None	DR- DF+	0.20 (0.62)	0.76 (2.78)+	None	None
$F_{t,t+2}$	0.11 (0.23)	1.23 (1.84)	DR- DF none	DR- DF+	0.06 (0.26)	0.61 (2.46)+	None	None
$F_{t,t+4}$	-0.18 (-1.44)	0.01 (0.04)	None	None	-0.11 (-0.75)	0.29 (1.54)	None	None

When the Libor implied forecasts were being considered, in no case was the change in the actual, or the forecast rates significantly affected by prior changes in those rates. With the government debt yield implied forecast, there were some (faint) indications that upwards (downwards) changes in policy rates (forecast rates) would lead to downwards (upwards) changes in forecast rates. It is difficult to make much sense of that. But the overall conclusion is that movements in forecast rates have virtually no predictive ability for actual policy rates, whereas movements in policy rates do bring about (Granger cause) subsequent changes in the forecast pattern of future rates.

Somehow running a Vector Error Correction system of equations between an actual series and the implied forecast of that same series seems a somewhat artificial exercise. So we also ran more intuitively applicable regressions comparing the change in the policy rate between  $t-i$  and  $t$  with the forecast made for interest rates at time  $t-i$  for time  $t$  less the actual policy rate at time  $t-i$ , i.e.,

$$R_t - R_{t-i} = b(F_{t,t-i} - R_{t-i})$$

The results are shown in Tables 2 and 3.

**Table 2**  
**Regression results using Government Debt data**

$$[IR (t)- IR (t-i)] = [\text{Forecast } (t,t-i)- IR (t-i)]$$

<b>i=</b>	<b>F (t,t-i)-IR (P value)</b>	<b>R sq.</b>	<b>DW</b>
<b>1</b>	<b>0.53 0.02</b>	<b>0.12</b>	<b>1.38</b>
<b>2</b>	<b>0.89 0.00</b>	<b>0.33</b>	<b>0.94</b>
<b>3</b>	<b>0.85 0.00</b>	<b>0.31</b>	<b>0.60</b>
<b>4</b>	<b>0.62 0.00</b>	<b>0.17</b>	<b>0.41</b>
<b>5</b>	<b>0.43 0.02</b>	<b>0.08</b>	<b>0.34</b>
<b>6</b>	<b>0.31 0.07</b>	<b>0.03</b>	<b>0.32</b>
<b>7</b>	<b>0.27 0.07</b>	<b>0.01</b>	<b>0.29</b>
<b>8</b>	<b>0.27 0.05</b>	<b>0.00</b>	<b>0.27</b>

**Table 3**  
**Regression results using LIBOR data**

$$[IR (t)- IR (t-i)] = [\text{Forecast } (t,t-i)- IR (t-i)]$$

<b>i=</b>	<b>F (t,t-i)-IR (P value)</b>	<b>R sq.</b>	<b>DW</b>
<b>1</b>	<b>0.15 0.32</b>	<b>0.01</b>	<b>1.50</b>
<b>2</b>	<b>0.25 0.15</b>	<b>0.03</b>	<b>0.74</b>
<b>3</b>	<b>0.17 0.33</b>	<b>0.01</b>	<b>0.62</b>
<b>4</b>	<b>0.13 0.43</b>	<b>0.00</b>	<b>0.49</b>
<b>5</b>	<b>0.11 0.47</b>	<b>0.00</b>	<b>0.47</b>
<b>6</b>	<b>0.08 0.58</b>	<b>-0.01</b>	<b>0.40</b>
<b>7</b>	<b>0.13 0.35</b>	<b>-0.01</b>	<b>0.39</b>
<b>8</b>	<b>0.17 0.17</b>	<b>-0.00</b>	<b>0.29</b>

Note the rapid decline in the DW ratio to remarkably low levels, indicating highly auto-correlated errors, despite the variables being in first differenced form. The coefficients are all positive, but become insignificantly different from zero at longer forecasting horizons. The fit for Libor implied forecasts is abysmal, and the fit for the government debt forecasts is very poor beyond the one year horizon.

Running the same regression with the addition of a constant showed a pattern of increasingly large negative constants, as the forecast horizon lengthened, combined

with larger and more significant coefficients on the forecast term. There was no improvement in the DW term, which continued to show highly autocorrelated residuals, see Tables 4a and 4b.

Perhaps the interpretation of this is that the (market) forecasts failed to pick-up the gentle trend decline in interest rates over this period. When this is separately taken into account, by a constant term in this latter equation, then the forecasts had some ability to match the fluctuating path of the actuals. Recall, however, that there is no suggestion that the implied time path of the money market yield curve in the UK's Inflation Report (IR) forecast might need to be adjusted by an unforecast downwards trend.

The conclusion of these empirical exercises is that the implied forecasts derived from money market yield curves are surprisingly poor predictors of future policy rates. The more interesting question is why is this so? In order to start to answer this, we looked at the auto-correlated pattern of residuals in each case. Figures 4a and 4b provide an example. This shows the residuals from the equation:-

$$R_t - R_{t-8} = b(FG_{t-t-8} - R_{t-8})$$

**Table 4a**  
**Regression results using Government data**

(a) The regression:

$$[\text{IR}(t) - \text{IR}(t-i)] = c + [\text{Forecast}(t, t-i) - \text{IR}(t-i)]$$

<b>i=</b>	<b>c</b> <b>(P value)</b>	<b>F (t,t-i)-IR</b> <b>(P value)</b>	<b>R sq.</b>	<b>DW</b>
<b>1</b>	<b>0.07</b> <b>0.38</b>	<b>0.72</b> <b>0.03</b>	<b>0.14</b>	<b>1.51</b>
<b>2</b>	<b>0.01</b> <b>0.90</b>	<b>0.89</b> <b>0.00</b>	<b>0.33</b>	<b>0.94</b>
<b>3</b>	<b>-0.14</b> <b>0.18</b>	<b>0.87</b> <b>0.00</b>	<b>0.33</b>	<b>0.63</b>
<b>4</b>	<b>-0.30</b> <b>0.04</b>	<b>0.73</b> <b>0.00</b>	<b>0.25</b>	<b>0.47</b>
<b>5</b>	<b>-0.38</b> <b>0.02</b>	<b>0.58</b> <b>0.00</b>	<b>0.18</b>	<b>0.40</b>
<b>6</b>	<b>-0.44</b> <b>0.02</b>	<b>0.48</b> <b>0.00</b>	<b>0.15</b>	<b>0.39</b>
<b>7</b>	<b>-0.52</b> <b>0.00</b>	<b>0.47</b> <b>0.00</b>	<b>0.18</b>	<b>0.37</b>
<b>8</b>	<b>-0.63</b> <b>0.00</b>	<b>0.50</b> <b>0.00</b>	<b>0.26</b>	<b>0.40</b>

**Table 4b**  
**Regression results using LIBOR data**

The regression:

$$[IR(t) - IR(t-i)] = c + [\text{Forecast}(t, t-i) - IR(t-i)]$$

<b>i=</b>	<b>c (P value)</b>	<b>F (t,t-i)-IR (P value)</b>	<b>R sq.</b>	<b>DW</b>
<b>1</b>	<b>-0.07 0.35</b>	<b>0.19 0.23</b>	<b>0.03</b>	<b>1.48</b>
<b>2</b>	<b>-0.12 0.25</b>	<b>0.32 0.08</b>	<b>0.06</b>	<b>0.73</b>
<b>3</b>	<b>-0.15 0.28</b>	<b>0.27 0.17</b>	<b>0.04</b>	<b>0.61</b>
<b>4</b>	<b>-0.21 0.24</b>	<b>0.27 0.19</b>	<b>0.03</b>	<b>0.49</b>
<b>5</b>	<b>-0.30 0.15</b>	<b>0.29 0.15</b>	<b>0.04</b>	<b>0.47</b>
<b>6</b>	<b>-0.39 0.09</b>	<b>0.29 0.13</b>	<b>0.05</b>	<b>0.43</b>
<b>7</b>	<b>-0.62 0.01</b>	<b>0.45 0.01</b>	<b>0.13</b>	<b>0.45</b>
<b>8</b>	<b>-0.90 0.00</b>	<b>0.62 0.00</b>	<b>0.29</b>	<b>0.39</b>

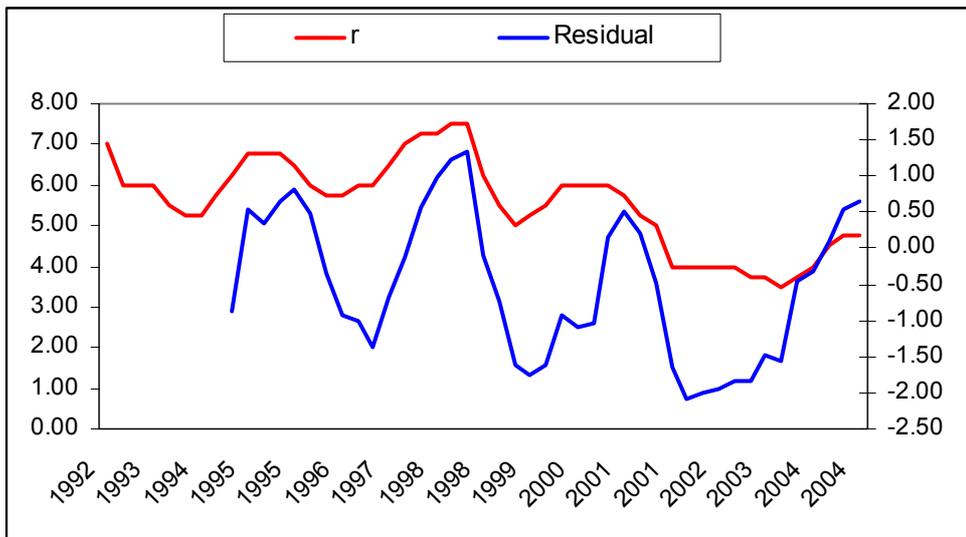
**Figure 4a**

→ Exercise: plot the residuals against the level of the interest rates, for the regression:

$$[IR(t) - IR(t-i)] = [\text{Forecast}(t,t-i) - IR(t-i)]$$

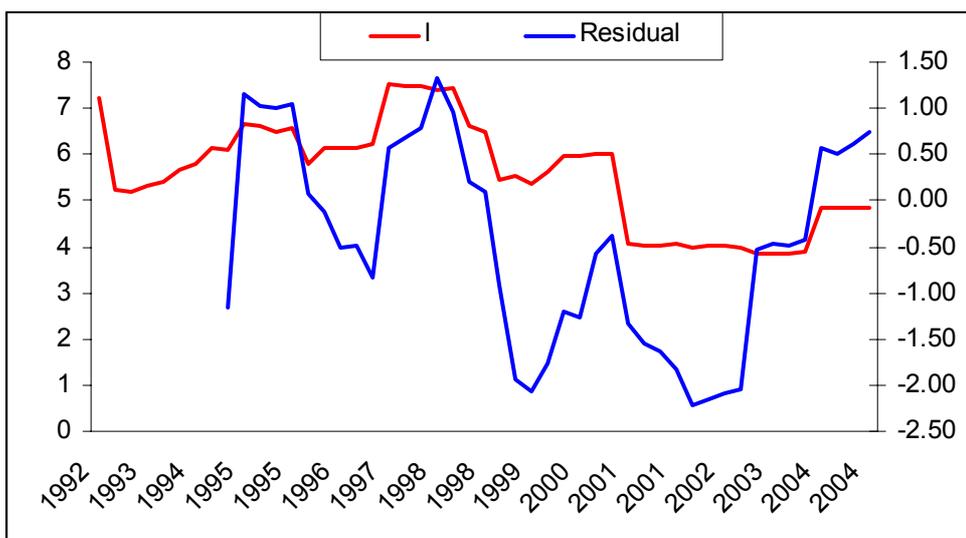
for  $i=8$ .

Using Gov data:



**Figure 4b**

Using Lib data:



What then becomes clear is that the residuals themselves closely follow the time path of policy rates.

What this implies is that, once the horizon is extended over one year, the market has no ability to forecast the future path of short-term money market rates. Making the market implied forecast the conditioning assumption for the IR, at least at horizons beyond four quarters, is just adding noise. Nor probably would the MPC be able to forecast any better, or pick a 'better' rate path. In so far as the focus horizon for the MPC is beyond one year, then on the grounds of forecasting ability alone, the best two alternatives might be:-

- (a) to revert to the constant rate assumption;
- (b) to use the money market yield curve over the next 2/3 quarters during which it can be shown to have some (slight) predictive capacity, and then revert either to a constant rate assumption, or to an assumed reaction function.

#### IV. Conclusion

There is more to be said in favour of the prior conditioning assumption of constant interest rates than is sometimes admitted. In particular, it provided a discipline of requiring prompt corrective action, in response to forecast inflationary shocks, in a context where 'too little, too late' may have been largely responsible for systemic inflationary pressures. Nevertheless in a framework in which MPCs intend, from time to time, to signal some future direction of change of interest rates, that conditioning assumption cannot be retained. It would be blatantly inconsistent to have the MPC

signalling a future direction of change of interest rates, while basing their forecast on unchanged rates.

Yet an MPC would rarely, if at all, want to indicate a direction of change beyond about 2 or 3 quarters hence. The future is just too uncertain. Moreover beyond that same horizon the evidence presented here suggests that the implicit forecasts of the money market have no predictive value. They are just noise. Earlier I argued that using the money market yield curve as the basis for forecasting also adds noise to the forecast, whenever the implied forecast is inaccurate or whenever the current policy decision surprises the market.

This suggests that the choice of money market implicit forward rates as the conditioning assumption for future policy rates in the IR is no panacea. Perhaps a hybrid might be better, using the money market yield curve up to the horizon within which it has some predictive power, say 2 quarters hence, and then tagging on beyond that a more stylized assumption. That stylized assumption could be constant rates beyond that horizon, or maybe some assumed reaction function.

It might just be worth adding that the patent difficulty of forecasting beyond some short horizon provides another reason for an MPC to refuse to offer a forecast of its own. There is no good reason to think that an MPC, any more than the market, can make reasonably good predictions of future interest rate paths, beyond a short horizon. If an MPC's predictions, beyond say 2/3 quarters hence, are also noise, then it would be better not to make, nor to publish them, since it would mislead by suggesting information where there was none.

But perhaps the most interesting question is the implied forecasts from money market yield curves are such poor predictors. That remains an issue for future research.

## Bibliography

Berg, C., Jansson, P. and A. Vredin, (2004), 'How useful are simple rules for monetary policy: The case of Sweden', Sveriges Riksbank Working Paper Series, no. 169.

Bernanke, B.S. and M. Woodford, (1997), 'Inflation Forecasts and Monetary Policy', Journal of Money, Credit and Banking, 29 (4), (November, Part 2), 653-684.

Bernhardsen, T. and A. Kloster, (2002), 'Transparency and Predictability on Monetary Policy', Economic Bulletin, Norges Central Bank, 2.

Boivin, J., (2004), 'Has U.S. Monetary Policy Changed? Evidence from Drifting Coefficients and Real-Time Data', Graduate School of Business, Columbia University, work in progress, January version.

Carriero, A., Favero, C.A. and I. Kaminska, (2003), 'Financial Factors, Macroeconomic Information and the Expectations Theory of the Term Structure of Interest Rates', unpublished manuscript.

Coppell, J. and Connolly, J., (2003), 'What do Financial Market Data tell us about Monetary Policy Transparency', Reserve Bank of Australia, Research Discussion Paper, 2003/05.

Diebold, F.X. and C. Li, (2003), 'Forecasting the Term Structure of Government Bond Yields', NBER working paper 10048, (October).

Duffee, G.R., (2002), 'Term Premia and Interest Rate Forecasts in Affine Models', Journal of Finance, (February), 405-443.

Goodhart, C.A.E., (1999), 'Central Bankers and Uncertainty', Keynes Lecture in Economics, 29 October 1998, reprinted in Proceedings of the British Academy, 101, pp 229-271.

Goodhart, C.A.E., (2001), 'Monetary Transmission Lags and the Formulation of the Policy Decision on Interest Rates', Federal Reserve Bank of St Louis Review, 83 (4) (July/August), 165-181.

Goodhart, C.A.E., (2004), 'What is the Monetary Policy Committee Attempting to Achieve?', in Macroeconomics, Monetary Policy, and Financial Stability: A Festschrift in Honour of Charles Freedman, Proceedings of a Conference held by the Bank of Canada, June 2003, (Ottawa: Bank of Canada).

Goodhart, C.A.E., (2005), 'The Monetary Policy Committee's Reaction Function: An Exercise in Estimation', Berkeley Electronic Press, forthcoming.

Gurkaynak, R.S., Sack, B. and E.T. Swanson, (2005), 'Do Actions Speak Louder than Words? The response of asset prices to monetary policy actions and statements', International Journal of Central Banking, 1(1), (June), 55-94.

Haldane, A.G. and V. Read, (2000), 'Monetary Policy Surprises and the Yield Curve', Bank of England Working Paper no. 102.

Jansson, P. and A. Vredin, (2003), 'Forecast-based Monetary Policy: The Case of Sweden', International Finance, 6 (3), 1-33.

Kuttner, K.N., (2001), 'Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds Futures Market', Journal of Monetary Economics, June 2001, 47(3), 523-44.

Lildholdt, P. and A.Y. Wetherilt, (2004), 'Anticipations of monetary policy in UK financial markets', Bank of England working paper no. 241.

Lomax, R., (2005), 'Inflation Targeting in Practice: Models, Forecasts and Hunches', Speech given at the 59<sup>th</sup> International Atlantic Economic Conference in London, March 12, forthcoming Bank of England Quarterly Bulletin, June 2005.

Mariscal, I. B-F. and P. Howells, (2005), 'Monetary Policy Transparency: Lessons from Germany and the Eurozone', paper in progress, University of the West of England, Bristol, (March).

Mishkin, F.S., (2004), 'Can Central Bank Transparency Go Too Far', in The Future of Inflation Targeting, eds. C. Kent and S. Guttman, Proceedings of a Conference, 9-10 August, (Reserve Bank of Australia: Sydney), 48-66.

Morris, S. and H. Shin, (1998), 'Unique Equilibrium in a Model of Self-Fulfilling Currency Attacks', American Economic Review, 88, 587-597, (1998).

Morris, S. and H. Shin, (2002), 'Social Value of Public Information', American Economic Review, 52 (5), December, 1521-1534.

Morris, S. and H. Shin, (2004), 'Coordination Risk and the Price of Debt', European Economic Review, 48, 133-153, (2004).

Morris, S., Shin, H. and H. Tong, (2005), 'Response to [L. Svensson's] "Social Value of Public Information: Morris and Shin (2002) is actually Pro Transparency, Not Con"', paper in progress, (May).

Perez-Quiros, G. and J. Sicilia, (2002), 'Is the European Central Bank (and the United States Federal Reserve) Predictable?', ECB Working Paper Series, no. 102.

Poole, W., Rasche, R.H. and Thornton, D.L., (2002), 'Market Anticipations of Monetary Policy Actions', The Federal Reserve Bank of St Louis Review, 84(4), 65-94.

Reifschneider, D.L., Stockton, D.J. and D. Wilcox, (1997), 'Econometric models and the monetary policy process', Carnegie Rochester Conference Series on Public Policy, 47, 1-37.

Romer, C.D. and D.H. Romer, (2004), 'A New Measure of Monetary Shocks: Derivation and Implications', University of California, Berkeley, work in progress, March version.

Rudebusch, G.D., (2002), 'Term Structure Evidence on Interest Rate Smoothing and Monetary Policy Inertia', Journal of Monetary Economics, (September), 1161-1187.

Rudebusch, G.D. and T. Wu, (2004), 'A Macro-Finance Model of the Term Structure, Monetary Policy and the Economy', paper presented at the Federal Reserve Bank of San Francisco Conference on 'Interest Rates and Monetary Policy', March 19-20.

Sack, B., (1998), 'Uncertainty, Learning and Gradual Monetary Policy', Finance and Economics Discussion Series, Board of Governors of the Federal Reserve System, July.

Sack, B., (2000), 'Does the Fed Act Gradually?', A VAR Analysis', Journal of Monetary Economics, 46, 229-56.

Svensson, L.E.O., (2001), 'Independent Review of the Operation of Monetary Policy in New Zealand: Report to the Minister of Finance', [www.princeton.edu/~svensson/](http://www.princeton.edu/~svensson/).

Svensson, L.E.O., (2003), 'The Inflation Forecast and the Loss Function', Chapter 4 in Central Banking, Monetary Theory and Practice, ed. P. Mizen, (Cheltenham, U.K.: Edward Elgar).

Svensson, L.E.O., (2004), 'Monetary Policy with Judgement: Forecast Targeting', paper presented at European Central Bank Conference on 'Monetary policy and imperfect knowledge', Wurzburg, Germany, (October).

Svensson, L.E.O., (2005), 'Social Value of Public Information: Morris and Shin (2002) is actually Pro Transparency, Not Con', paper in progress, (February).

Thornton, D., (2004), 'Testing the Expectations Hypothesis: Some new evidence for Japan', Bank of Japan, Institute for Monetary and Economic Studies, Discussion Paper No. 2004-E-3, February.

Woodford, M., (2004), 'Inflation Targeting and Optimal Monetary Policy', Federal Reserve Bank of Saint Louis Review, 86 (4), 15-41.

Woodford, M., (2005), 'Central Bank Communication and Policy Effectiveness', Draft paper May 12 prepared for presentation to the Stockholm Riksbank Conference, June 10-12.