The impact of inflation news on financial markets

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This article[1] examines the same-day reaction of a variety of UK asset prices to monthly RPI inflation announcements over a sample period from the early 1980s until April 1997, the month before the Bank of England was given operational independence for setting interest rates. These announcements are decomposed into their expected and unexpected, or 'news', components using survey data on financial analysts' inflation expectations. It is found that markets are efficient, in the sense that asset prices do not respond to the expected component of RPI announcements. Generally, only government bond prices appear sensitive to inflation news—particularly after late 1992, when the United Kingdom adopted an explicit inflation target. The responsiveness of implied medium and long-term forward inflation rates after 1992 is consistent with the 'expected inflation hypothesis', a finding that suggests that the pre-independence inflation-targeting framework was not seen as fully credible by the financial markets. But the declining responsiveness of bond yields and implied forward inflation rates to inflation news over the period of operation of the framework suggests that its credibility improved over time.

Introduction

How financial markets respond to announcements of economic data is of interest for two main reasons.[2] First, it enables an assessment of the efficiency of financial markets in processing information—provided that the announced information can be decomposed into its expected and unexpected components, we can test whether asset prices only respond to the unexpected component of new data, or 'news', as the 'efficient markets hypothesis' would suggest. Second, how financial markets react to news may tell us something about the markets' perception of the authorities' reaction function, and so about the credibility of monetary policy.

This article focuses on the second issue—the credibility of monetary policy—examining the same-day reaction of a variety of UK asset prices to monthly retail price index (RPI) inflation announcements from the early 1980s until April 1997, the month before the granting of operational independence to the Bank of England.[3] In this period, the UK monetary policy framework underwent several important changes (moving from various forms of monetary targeting to informal and then formal exchange rate targeting within the ERM, and then to inflation targeting), but low inflation remained the ultimate policy objective. So we would expect financial markets to have been sensitive to inflation news throughout the period, though it seems plausible that the potential significance of inflation news may have increased after October 1992, when the United Kingdom adopted an explicit inflation target. We examine this possibility by focusing on sub-samples of the data.

The identification of RPI inflation news is clearly critical to the analysis. This article uses survey data on financial market analysts' expectations of RPI inflation made available by Money Market Services (MMS), which enable us to construct a consistent measure of inflation news back to the early 1980s,[4] without the need to identify expectations using an econometric model of inflation. However, repeating the analysis using inflation expectations generated from a simple autoregressive time-series model (ie an econometric model that predicts inflation on the basis of past inflation behaviour) produces results broadly similar to those reported below.[5]

The rest of the article is structured as follows. The second section discusses the two principal theories that explain why asset prices may change in response to news about inflation; the third section sets out the empirical framework used in the analysis; the fourth section discusses the raw data and the measure of inflation expectations used to derive inflation news; the empirical results are set out in the fifth section; and the final section concludes.

(1) This article summarises some of the analysis in 'Asset price reactions to RPI announcements', *Bank of England Working Paper,* forthcoming.
(2) See Wachtel (1992).
(3) For an earlier study of the impact of UK RPI announcements, see Goodhart and Smith (1985), who also examine the impact of money, PSBR and visible trade announcements. Previous studies of inflation announcements in other countries are Urich and Wachtel (1984), Smirlock (1986) and Fischer (1993). A more recent descriptive analysis of the effects of various UK data releases, including RPIX, on the sterling markets from January 1996 to June 1998 appeared in the *Quarterly Bulletin*, August 1998, pages 192–93, entitled 'News and the sterling markets'.
(4) The MMS series we use refers to the month-on-month percentage change in the RPI and goes back to December 1981.
(5) These results are omitted for brevity. Details are contained in the forthcoming *Working Paper* (see footnote 1).

Underlying theories

Why might asset prices respond to inflation news? The literature on announcement effects suggests two main theories: the 'policy anticipations hypothesis' (PAH) and the 'expected inflation hypothesis' (EIH).(1) The PAH implies that current inflation outturns that are higher/lower than expected will lead the markets to anticipate that the authorities will tighten/loosen monetary policy, in other words raise/lower (real) interest rates.(2) So the PAH can be thought of as broadly consistent with monetary policy credibility, as it assumes that the authorities are committed to offsetting any underlying inflationary pressures signalled by unexpected rises/falls in measured inflation.(3) The EIH, by contrast, suggests that when current inflation outturns are higher/lower than expected, the markets revise up/down the inflation they expect in the future—an outcome unlikely to be consistent with monetary policy credibility. This could reflect a belief that the authorities will be unwilling to offset fully any future inflationary implications signalled by the inflation news, because they are not committed to a specific inflation objective. Alternatively, the news might have no implications for immediate inflationary pressures, but might be taken as a signal of the authorities' true inflation preferences. So for example, higher-than-expected inflation might be interpreted as suggesting that the authorities were more tolerant of inflation than previously thought, thus leading the markets to raise their longer-term expectations of inflation. Of course, the PAH and EIH hypotheses need not be mutually exclusive, and the reaction we observe in practice could result from a combination of these effects—the authorities might be expected to react to an inflationary shock by raising (real) interest rates (consistent with the PAH), but not by enough to prevent a rise in expected inflation (consistent with the EIH).

The symmetry assumption implicit in both theories, that the market will react equally strongly whether inflation is higher or lower than expected, need not always hold, even if policy is viewed as fully credible (see Fischer (1993)). If, for example, the authorities are undershooting their inflation target, then a positive inflation shock need not require any response (unchanged expected real interest rates and higher expected inflation), while a negative inflation shock may enable them to relax policy (lowering expected real interest rates, with ambiguous effects on expected inflation).(4) Nevertheless, by definition, such asymmetries would be consistent with credibility only if they were restricted to expectations in the shorter term (ie within the two to three-year period in which monetary policy changes are likely to have their biggest impact on inflation). We allow for asymmetric responses in our empirical analysis below.

Using financial market reactions to inflation shocks to discriminate between the PAH and EIH is difficult in practice, because expected inflation and real interest rates are rarely directly observable. For this reason, other studies have looked at a range of asset price reactions in order to test these theories. The difficulty is that the predictions of the PAH and EIH for some asset prices are either the same or ambiguous. For example, if inflation turns out higher than expected, the PAH predicts that nominal interest rates, at least at shorter maturities, will rise in response to higher expected real interest rates (and to higher inflation in the short run to the extent that some inflation inertia is unavoidable whatever the policy reaction of the authorities), through the Fisher equation.(5) But the EIH also predicts this, as higher-than-expected inflation would be expected to raise future inflation and thereby current short-term, as well as longer-term, nominal interest rates. (It is also possible that the inflation risk premium would rise, either in line with or independently of any change in the expected average level of inflation, reflecting greater uncertainty about future inflation, but again this would indicate that the authorities lacked credibility.)

In principle, looking at longer-term expected nominal interest rates gets round this problem, because real interest rates (and any real rate risk premium) are likely to be invariant to monetary policy at longer maturities, and so the response of longer-term nominal rates to inflation news would be more likely to reflect an effect from expected inflation (as implied by the EIH hypothesis). But since spot rates at all maturities will still be affected by movements in short-term interest rates (because under the expectations hypothesis of the term structure, long rates are an average of expected future short rates), it is necessary to examine the behaviour of longer-term forward interest rates, in order to separate out the effects of any movements in the shorter end of the yield curve. This requires 'fitting' forward rate curves to data on spot rates.

Apart from longer-term forward interest rates, the predictions of the PAH and EIH are only unambiguously different in the case of exchange rates: the PAH predicts an appreciation in line with higher expected short real interest rates, whereas the EIH predicts a fall in line with higher expected inflation (and hence a higher expected price level relative to overseas). So particular attention is given to the reaction of exchange rates and forward interest rates (derived by the Bank of England) to RPI news in the empirical analysis below. But the existence of a UK market for index-linked government bonds (IGs) enables us to go one step further, by comparing the differing reaction of conventional gilts and IGs to infer movements in real interest rates and expected inflation

(1) See Cornell (1983).
(2) The assumption is that (at least on average) today's inflation news provides information on incipient inflationary pressures in the economy which, under the PAH, it is believed the authorities will want to offset in order to maintain their inflation objectives. If one month's inflation news has no future implications for inflation, then clearly there would be no need for a monetary policy response.
(3) Full credibility would require the anticipated policy response to be sufficient to offset fully any future longer-term inflationary implications signalled by the news.
(4) The discussion here and throughout this section abstracts from the impact on very short-term real rates, which could be different. See discussion below.
(5) In its simplest form, the Fisher equation states that the nominal interest rate is equal to the real interest rate plus expected inflation. A more general version would also include various risk premium terms, most importantly the inflation risk premium.

more directly.[1] Although comparisons between individual bond prices are distorted by idiosyncratic coupon, tax and maturity effects, the implied real rates and inflation rates calculated by the Bank of England (see Deacon and Derry (1994a),(1994b)) explicitly adjust for these effects, and these data are used in the analysis. Of course, some problems remain with these data—notably, the impact of any inflation risk and liquidity premia is not directly identified—but as long as risk premia remain broadly constant on inflation announcement days, then the daily changes in real/inflation rate measures that we examine will not be seriously distorted.[2] And as mentioned above, even if movements in implied forward inflation rates primarily reflect changes in the inflation risk premium, rather than changes in the expected level of inflation, the implications for the credibility of policy would be the same. Nevertheless, as a further check on the robustness of our findings and for consistency with other studies, the analysis is also conducted in terms of a range of other asset price reactions.[3]

Empirical framework

To assess the impact of inflation news on asset prices, we use the time-series event-study methodology that has typically been used in the literature on money announcement effects. Thus we first estimate the following model:

$$\Delta Y_t = \alpha + \beta_1 (\pi_t - \pi_t^e) + \beta_2 \pi_t^e + u_{1t} \qquad \textbf{(1)}$$

where ΔY_t is the change in the relevant asset price/yield from close of business on the working day prior to the announcement to close of business on the day of the announcement; π_t is that day's inflation announcement (which refers to the month-on-month percentage change in the RPI of the previous month); π_t^e is expected monthly inflation; α, β_1 and β_2 are parameters; and u_{1t} is an error term.

Our primary interest is in the first term, $(\pi_t - \pi_t^e)$, which represents the unanticipated inflation component. The second term is the expected component, which should be irrelevant in the regression if markets are efficient. So we expect (and typically find) that $\beta_2 = 0$, and for this reason most of the regression results we report in Annex B have the simpler form:

$$\Delta Y_t = \alpha + \beta (\pi_t - \pi_t^e) + u_{2t} \qquad \textbf{(2)}$$

We also want to test for asymmetric effects of inflation being higher or lower than expected. So we also report results from the following regression:

$$\Delta Y_t = \alpha + \beta_+ D_+(\pi_t - \pi_t^e) + \beta_- D_- (\pi_t - \pi_t^e) + u_{3t} \qquad \textbf{(3)}$$

where $D_+ = 1$ if $(\pi_t - \pi_t^e) > 0$ and 0 otherwise, and $D_- = 1$ where $(\pi_t - \pi_t^e) < 0$ and 0 otherwise. If the response to higher-than-expected inflation is of the same absolute magnitude as the response to lower-than-expected inflation, then obviously $\beta_+ = \beta_-$.[4]

Equations **(1)**, **(2)** and **(3)** are potentially vulnerable to a problem of omitted variables. But by focusing on the same-day movement in asset prices, we hope to minimise this problem and, provided that any other relevant news on the day is uncorrelated with inflation news, the parameter estimates remain unbiased. It is nevertheless important to pay close attention to outliers in the analysis, which may reflect other important news items.

The sample period for the empirical work runs from January 1982 to April 1997, but as there were major shifts in the monetary policy framework in this period, the sample is broken into three sub-periods: January 1982 to September 1990, a period that included various attempts at targeting (first broad and then narrow) money aggregates, as well as a brief period of informal exchange rate targeting, when sterling shadowed the Deutsche Mark, from March 1987 to March 1988; October 1990 to September 1992, a period of formal exchange rate targeting inside the ERM; and October 1992 to April 1997, a period when the government pursued an explicit inflation target, but before the Bank of England was given operational independence for setting interest rates.

Data

Inflation news

To assess the impact of unanticipated inflation on asset prices, we first need a measure of expected inflation. The MMS data on expected RPI inflation used in this article are based on a monthly telephone survey of around 20 market analysts, who are asked for their forecast of the month-on-month percentage change in the RPI figure to be released that month. Given publication lags, this refers to monthly RPI inflation in the previous month. The survey is normally conducted a week to a fortnight before the release of the RPI data.[5] We measure the inflation surprise as the

(1) Earlier studies by Tessaromatis (1990) and Peel, Pope and Paudyal (1990) examined the impact of M3 announcements in this way. One problem with these sorts of comparisons is that index-linked gilts are not perfectly indexed for inflation because of an indexation lag, which means that they are not protected in the eight-month period prior to maturity. Therefore, especially at shorter maturities, movements in real interest rates may also reflect changes in inflation expectations. This problem is controlled for, in principle, by the Bank's method of estimating the inflation term structure.

(2) Of course, risk premia are likely to be time-varying, but the assumption that they are slow-moving and therefore change little on a daily basis seems plausible. And, for reasons stated in the text, our analysis does not depend on this assumption.

(3) We have also examined the announcement-day effect on individual index-linked and conventional bonds. These results were broadly consistent with those reported using the Bank's estimated term structure and are therefore not reported here.

(4) In principle, it might be expected that asymmetries could also arise according to whether the inflation outturn was greater or less than the authorities' inflation target. We do not examine this hypothesis in what follows, because of difficulties in quantifying the implicit inflation target before 1992, but since the sample period we consider was broadly one of disinflation, it seems likely that inflation was always on the same side of the objective through most of the period.

(5) Ideally, we would want to measure expected inflation immediately prior to the release of the RPI data, so that expectations would incorporate all the relevant information available up to that point. If we assume that markets are efficient, then any news during the intervening period between the survey and the announcement will already have been factored into asset prices by the time of the announcement, and our measure of the responsiveness of asset prices to news will potentially be distorted. Our results have to be seen in the light of this caveat. However, this problem may be less serious if market participants nevertheless use the MMS survey forecast as their best guide to market sentiment.

difference between the actual monthly RPI outturn and the median estimate from the MMS survey.(1)

Of course, the UK inflation target since October 1992 has been specified in terms of RPIX rather than RPI inflation, but using RPI expectations as the basis for our measure of inflation news throughout enables us to derive a consistent measure over the full sample period; MMS only began sampling RPIX inflation expectations from the time of the February 1991 release. Moreover, given the focus of the media and markets on the 'headline' RPI figures over much of the sample period, it is unclear whether or not RPI or RPIX news is the more relevant variable for our purposes.

Asset price data

We examine the reaction of a range of asset prices to RPI announcements, as well as movements in the estimated forward interest rate term structure for UK government bonds, decomposed into their implied real and inflation components.(2) These variables are listed in Table A.

Table A
Asset price data

FT-SE 500 price index	Jan. 1962 = 100
Three-month Libor rate	Per cent per annum
5, 10 and 20-year bond yields	Per cent per annum
£ effective exchange rate	Jan 1990 = 100
DM/£ exchange rate	DM/£
$/£ exchange rate	$/£
2, 5 and 10-year forward nominal rates	Per cent per annum
2, 5 and 10-year forward real rates	Per cent per annum
2, 5 and 10-year forward inflation rates	Per cent per annum

The asset price response is measured by the change from close on the day prior to the RPI announcement to close on the day of the announcement. Average responses and the standard deviations of responses are given in Annex A (Tables 1 and 2). These statistics suggest that the majority of asset prices varied most in the ERM period; this conclusion remains robust to the exclusion of large movements on the dates of the United Kingdom's entry and exit. They also show that implied forward nominal, real and inflation rate movements have generally been much less volatile during the 1990s than in the 1980s, perhaps reflecting higher and more variable inflation during the earlier period.

Results

Asset prices

The starting-point for our empirical analysis is equation **(1)**. Running this regression for each of our asset price measures over the full sample and each sub-period, we find that expected RPI inflation does not explain movements in asset prices on the day of RPI announcements—the hypothesis that β_2 equals zero cannot be rejected at the 5% confidence level. This suggests that asset markets are efficient with respect to inflation announcements, in the sense that only the unexpected component of the announcement (if anything) is correlated with price changes. The results are reported in Annex B, Table 1.

The results for equations **(2)** and **(3)**, which exclude the term for expected inflation (assuming, in other words, that only the news element of the RPI announcement affects asset prices), suggest that government bond yields show the most sensitivity to unanticipated inflation (see Annex B, Tables 2 and 3). This response is particularly marked both in size and statistical significance in the third sub-period, during which the United Kingdom pursued an inflation target. (This result also holds if we measure inflation news using the time-series model forecasts mentioned earlier.) In the period since October 1992, the estimated β coefficients imply that an unanticipated 1 percentage point increase in monthly RPI inflation was associated with an announcement-day rise in five, ten and twenty-year (spot) bond yields of about 20 basis points on average; and the R^2 statistics suggest that inflation news explained between 20% and 25% of yield movements on RPI announcement days. Re-running the regression with news disaggregated into positive and negative components suggests that there is an asymmetric response: only the response to lower-than-expected inflation is statistically significant at conventional levels, and the absolute size of the response is larger at the longer (ten and twenty-year) maturities.

There is also some evidence that bond yields responded to inflation news in the pre-ERM period. Yields at all maturities show positive coefficients, though only the results for five-year yields are statistically significant at the conventional 5% level, and the overall explanatory power of the regression is quite low. Again, when the regressions are re-run disaggregating news into positive and negative components, there are strong asymmetries, but in this case it appears that yields responded more sharply when inflation was higher than expected. As explained earlier, we cannot draw direct inferences from these results for the validity of either the policy anticipations or expected inflation hypothesis, though the responsiveness of long bond yields in both periods seems more likely to be consistent with the latter.

The only other asset prices that showed any significant response to inflation news over the sample period were the DM/£ rate and the £ effective rate during the United Kingdom's ERM membership. These results appear consistent with the PAH, since they imply that sterling appreciated when inflation was higher than expected, suggesting that it was responding to an expected policy tightening. But the response is again asymmetric: sterling showed no tendency to depreciate relative to the currencies of its trading partners if UK inflation turned out lower than

(1) We tested the MMS data to see if they satisfy rationality, using standard tests for 'unbiasedness' and 'weak efficiency', which are both needed for rationality to hold. The forecasts were found to be unbiased predictors of inflation outturns, and weak inefficiency (ie a situation where the forecasts do not fully incorporate past inflation information) was only found in the first sub-period, perhaps because survey participants did not fully take into account seasonality in the RPI data caused by Budget tax changes (including a Budget dummy in the regression eliminates the statistical significance of the seasonal lag). Raw data, unadjusted for Budget/seasonal effects, were used for the results reported in the Annex, but these results were also tested for robustness to the inclusion of additive and interactive Budget dummy variables, as well as dummies for possible outliers. See forthcoming *Working Paper*, Joyce and Read (1999) for further details.
(2) Data from the Bank of England's daily estimated interest rate term structure, see Deacon and Derry *op cit*.

anticipated. One possible interpretation is that the authorities were perceived to be overshooting their (implicit) inflation target in this period, and so were thought likely to accommodate weaker-than-expected inflation, while tightening in response to bad inflation news. But given the small sample, we need to be particularly cautious in interpreting these results. Moreover, their statistical significance is sensitive to the inclusion of dummies for April 1992 (which coincided with a general election) and September 1992 (the UK exit from the ERM).(1)

The responses to RPI news of the FT-SE 500 index, three-month Libor rate and $/£ rate are all statistically insignificant in each sub-period. The fact that three-month interest rates do not respond to inflation news is consistent with the results of previous studies,(2) though it represents something of a puzzle in the ERM period if we interpret the exchange rate results as reflecting a policy anticipations effect. But again, the absence of a response may reflect small-sample problems.

The possibility that movements in the three-month rate may be affected by perverse movements in very short-term real interest rates may also be relevant in explaining these results. So, for example, higher-than-expected inflation last month might be expected to continue in the short term, thereby reducing very short real interest rates, even if (as under the PAH) the authorities are expected to want to act (but not instantaneously) to raise nominal and hence real interest rates. This reflects the fact that very short-maturity nominal rates are directly controlled by the monetary authorities, through their money-market dealings. Since three-month rates are market-determined, they would also be affected by any perverse reaction of very short real interest rates. So, for this example of higher-than-expected inflation (the results obviously apply with the opposite sign when inflation is lower than expected), the fall in ultra-short real interest rates could conceivably partly offset the impact on nominal three-month rates of higher expected inflation, and higher real interest rates for horizons beyond the policy reaction lag of the authorities. If this effect were important, then our regression results could be misleading. (It is certainly interesting in this context that, though statistically insignificant, all the news regression coefficients reported are negatively signed, but, of course, this does not establish the validity of the argument.)

Inflation term structure

The results in Annex B clearly suggest that gilts react to RPI inflation shocks, and that their responsiveness increased sharply during the period when the United Kingdom explicitly targeted inflation. But whether we should interpret this in terms of a policy anticipations effect or an inflation expectations effect (or as evidence of the authorities' credibility or lack of it) is unclear. As noted earlier, the sensitivity of nominal bond yields to inflation news could be consistent with either hypothesis. This is why examining movements in the Bank's estimated inflation term structure is potentially useful, because it provides explicit, though not unproblematic, measures of expected inflation and real interest rates. And by focusing on movements in forward rather than spot rates, we can isolate the impact at various maturities, which may otherwise be obscured by the averaging effect of looking at spot yields, as discussed above. Results from regressions of announcement-day changes in forward nominal rates, forward inflation rates and forward real interest rates are reported in Annex B, Table 4. The results show that the sensitivity of nominal forward rates to inflation news follows a similar pattern to that for bond yields. The recent period of inflation targeting stands out, in that only during this period are the response coefficients at both five and ten years statistically significant (the response of two-year nominal forward rates was not significant in any period). By contrast, during the ERM period, none of the nominal forward rates responded significantly to inflation news, and in the pre-ERM period, only the response coefficient on the five-year nominal rate is statistically significant.

The response of nominal forward rates to inflation news during the inflation-targeting period could in principle (as with spot bond yields) be consistent with either the EIH or the PAH (or some combination). But the fact that forward nominal rates respond to inflation news more at longer than at shorter horizons suggests that these movements primarily reflect changes in expected inflation rather than changes in expected real interest rates, and the regressions for implied forward real rates and inflation rates seem to support this interpretation. Though implied forward real rates at the five-year maturity show a statistically significant response to inflation news, implied forward inflation rates also show a positive and statistically significant response at both five and ten-year maturities. So though the market appeared to expect some eventual policy tightening in response to higher-than-expected inflation (though not in the short term, at least judged by the results for two-year forward real rates), this accompanied higher expected inflation in the longer term. As discussed earlier, this change in inferred inflation expectations might reflect a revised view of the extent of incipient inflationary pressures or risks(3) in the economy and/or a revised view of the authorities' true inflation target. Overall, yield curve movements, at least at the medium to long end, are therefore consistent with the expected inflation hypothesis.

These results suggest that the post-1992 inflation-targeting framework lacked full credibility. Further insights into this emerge from re-running the regression including positive and negative news components separately (see Annex B, Table 5). This shows that during the inflation-targeting period, longer-term expected inflation, both at five and

(1) When dummy variables for both these dates are included, the response coefficient in the DM/£ regression is only weakly statistically significant.
(2) See, for example, Goodhart and Smith (1985) for the United Kingdom, and Urich and Wachtel (1984) or Roley and Troll (1983) for the United States.
(3) As discussed earlier, movements in implied forward inflation rates might reflect changes in the inflation risk premium, as well as (or even instead of) changes in the level of expected inflation. But neither explanation would be consistent with monetary policy credibility.

ten-year horizons, responded significantly to RPI announcements only when inflation outturns proved to be lower than expected. One interpretation of this asymmetry is that it reflected a period when the authorities were in the process of building up credibility for the new monetary framework. So the markets required evidence of lower-than-expected inflation to revise down their long-term inflation expectations towards the stated target. But further analysis shows that this result is sensitive to one large downward movement on 12 February 1993, and so this interpretation has to be tentative.(1)

The results for the post-1992 inflation-targeting period are also sensitive to which part of the sample is chosen. If we split the sample into two broadly equal sub-periods (October 1992 to December 1994, and January 1995 to April 1997) and re-run the regressions, we cannot reject the hypothesis that the responsiveness of implied forward inflation rates to inflation news (whether positive or negative) was insignificant in the second sub-period. (This result carries over to nominal forward rates and yields.) In other words, it appears that the strong and statistically significant (average) response of forward rates to inflation news over the four-and-a-half year period of inflation targeting can be attributed to behaviour in the first half of the period. One interpretation of this is that when the new framework was set up, financial markets were initially uncertain as to the authorities' intentions. Despite the various measures introduced to increase the openness and transparency of the monetary framework,(2) better-than-expected RPI outturns also seem to have been needed to demonstrate the authorities' commitment to the inflation target. Our results suggest that, as more information became available on the operation of the framework and the confidence of financial markets in the authorities' commitment to low inflation increased, yields stopped responding to short-term inflation news. It is hard to reach a definitive conclusion, but these results are consistent with there having been some improvement in the credibility of the inflation-targeting framework during the period of its operation.

How do we explain the results for the earlier periods? As far as the ERM period is concerned, the lack of responsiveness of implied forward inflation rates is consistent with monetary policy being seen as credible, which to some extent would support the evidence on exchange rates. But the lack of any reaction of either real rates or nominal short rates during this period is something of a puzzle. Overall, the small sample size and fragility of the results makes it hard to draw strong conclusions.

The results for the earlier, pre-ERM period are also difficult to interpret. Real rate expectations appear to have risen at the longer five and ten-year maturities in the event of unexpected increases in inflation, but not to have fallen when inflation turned out lower than expected. At the same time, implied forward inflation rates at the five-year maturity appear to have risen in response to higher-than-expected inflation news, while at the ten-year maturity they appear, if anything, to have fallen (though the results where news is disaggregated are not statistically significant at 5%). One interpretation of these results would be that the market believed the authorities would not want to respond to higher inflation outcomes in the short term, but would be forced to react in the medium term, though not sufficiently to prevent inflation rising. Certainly, these results seem difficult to reconcile with policy being fully credible in this period, though we need to be cautious in drawing conclusions, given the small size and consequent illiquidity of the IG market in the early part of this period.(3) When the results are re-run excluding the earlier part of the sample up to March 1984, none of the implied forward inflation rates appears to respond significantly to inflation news, an outcome apparently consistent with monetary policy credibility. One perhaps more plausible explanation could simply be that inflation surprises carried less information on future inflation pre-1992, reflecting higher average inflation and inflation uncertainty, and the fact that the authorities had no explicit inflation target. During 1982–90, monthly inflation averaged around 0.5%, compared with 0.2% between 1992–97, and inflation was considerably more volatile. So it would have been quite consistent with rational behaviour for financial markets to have placed less weight on short-term inflation movements, and so for asset prices to have exhibited less sensitivity to RPI news.

Summary and conclusions

This article has examined the same-day reaction of a variety of asset prices to monthly RPI announcements for a sample beginning in the early 1980s and ending in April 1997, the month before the Bank of England was given operational independence for setting interest rates. Of the assets considered, gilts were found to be the most sensitive to the RPI announcements, particularly during the post-1992 period of inflation targeting. Consistent with market efficiency, it was found that gilt yield movements only occurred in response to the unexpected (news) component of RPI announcements.

These movements are interpreted in more detail by examining the Bank's estimated daily interest rate term structure, which allows us to decompose yield movements—subject to the caveats on risk premia discussed above—into shifts in implied inflation and in real interest rate expectations. During the period of inflation targeting, it is found that movements in forward nominal rates at the longer end of the yield curve reflect changes in implied forward inflation rates, consistent with an inflation expectations effect. But some evidence is also found of an asymmetric

(1) The shift in yields reflected a fall in inflation to its lowest level for 25 years. *The Financial Times* of 13 February reported that '[t]he inflation news, described by one seasoned market dealer as 'stunningly good', transformed the gilts market...'.
(2) Of these measures, the most important were probably the publication of the quarterly *Bank of England Inflation Report* (from February 1993) and the decision to publish the minutes of the monthly Chancellor-Governor meetings (from April 1994).
(3) In June 1982, for example, IGs represented only 4% of the outstanding stock of government bonds.

response to inflation news, with inflation expectations appearing to fall in response to favourable news on RPI, but not rising in the event of higher-than-expected inflation outturns. Moreover, the analysis suggests that the responsiveness of yields and implied forward inflation rates to news appears to relate solely to the first few years of operation of the inflation-targeting framework.

Although any conclusions must remain tentative, particularly given the small size of the sample, it is argued that these results are inconsistent with monetary policy being seen as fully credible, at least during the early part of the pre-independence inflation-targeting framework. Our preferred interpretation is that the authorities were still in the process of building credibility at that time, with the markets requiring evidence of lower-than-expected inflation to revise their longer-term inflation expectations down towards the explicit target. But the declining responsiveness of bond yields and implied forward inflation rates to inflation news over the period that the framework operated suggests that its credibility improved over time.

Annex A

Table 1
Asset price changes on RPI announcement days

μ = average response, σ = standard deviation

	Sample 1.82–9.90 N = 105		Sample 10.90–9.92 N = 24		Sample 10.92–4.97 N = 55		Sample 1.82–4.97 N = 184	
	μ	σ	μ	σ	μ	σ	μ	σ
FT-SE 500	1.17	7.38	-0.467	17.6	1.57	16.0	1.07	12.1
3-month Libor	0.014	0.158	-0.010	0.122	0.005	0.037	0.008	0.128
5-year yield (a)	0.0003	0.078	-0.011	0.153	-0.010	0.077	-0.005	0.091
10-year yield (a)	-0.001	0.079	-0.012	0.141	-0.010	0.085	-0.005	0.091
20-year yield (a)	0.0001	0.072	-0.010	0.113	-0.013	0.077	-0.006	0.080
£ effective	-0.019	0.369	0.037	0.367	0.025	0.328	0.001	0.356
DM/£	-0.0003	0.013	0.001	0.010	0.001	0.010	0.0002	0.012
$/£	0.0001	0.012	0.001	0.016	0.001	0.010	0.0004	0.012

Note: N = Number of observations.

(a) Sample starts January 1983.

Table 2
Implied forward interest rate changes on RPI announcement days

μ = average response, σ = standard deviation

	Sample 4.82–9.90 N = 102		Sample 10.90–9.92 N = 24		Sample 10.92–4.97 N = 55		Sample 4.82–4.97 N = 181	
	μ	σ	μ	σ	μ	σ	μ	σ
2-year nominal (a)	0.011	0.312	-0.013	0.193	-0.014	0.095	0.001	0.251
5-year nominal (a)	-0.023	0.246	-0.020	0.114	-0.009	0.108	-0.018	0.198
10-year nominal (a)	0.012	0.332	0.006	0.172	-0.017	0.108	0.003	0.264
2-year real	-0.011	0.105	0.007	0.104	0.001	0.062	-0.005	0.093
5-year real	-0.006	0.056	0.017	0.064	-0.001	0.041	-0.002	0.053
10-year real	-0.001	0.044	0.018	0.087	-0.001	0.033	0.002	0.049
2-year inflation	0.014	0.318	-0.020	0.240	-0.015	0.100	0.001	0.260
5-year inflation	-0.024	0.255	-0.037	0.110	-0.008	0.098	-0.021	0.202
10-year inflation	0.017	0.352	-0.013	0.172	-0.017	0.106	0.003	0.278

Note: N = Number of observations.

(a) Sample starts January 1982.

Annex B

Table 1
Asset price response to expected inflation and inflation news—equation (1)

$\Delta Y_t = a+\beta_1(\pi-\pi^e)+ \beta_2\pi^e+u_t$

	Sample 1.82–9.90 N = 105					Sample 10.90–9.92 N = 24					Sample 10.92–4.97 N = 55					Sample 1.82–4.97 N = 184				
	β_1	β_2	R^2	*DW*	*H* (a)	β_1	β_2	R^2	*DW*	*H* (a)	β_1	β_2	R^2	*DW*	*H* (a)	β_1	β_2	R^2	*DW*	*H* (a)
FT-SE 500	-2.64 *0.8*	0.78 *0.5*	0.01	1.7	2.3	12.08 *0.6*	-8.74 *0.9*	0.05	2.1	0.0	-6.06 *0.5*	-10.13 *1.7*	0.06	2.2	1.0	-1.61 *0.4*	-2.75 *1.3*	0.01	2.2	0.0
3-month Libor	-0.04 *0.5*	-0.04 *1.1*	0.02	1.9	0.8	-0.21 *1.4*	-0.01 *0.2*	0.09	2.0	0.4	-0.03 *1.0*	-0.03 *1.4*	0.05	2.2	3.8	-0.05 *1.0*	-0.03 *1.2*	0.01	1.9	0.0
5-year yield (a)	0.09(b) *2.3*	-0.01 *0.6*	0.05	2.3	1.1	-0.16 *0.8*	0.03 *0.4*	0.04	1.9	3.7	0.18(d) *3.5*	0.04 *1.6*	0.22	2.1	1.4	0.08(c) *2.4*	0.01 *0.5*	0.04	2.2	0.3
10-year yield (a)	0.06 *1.7*	0.01 *0.5*	0.04	2.1	0.8	-0.13 *0.8* [*0.6*]	0.03 *0.4* [*0.5*]	0.03	2.0	4.4(c)	0.22(d) *4.1*	0.04 *1.4*	0.27	2.4	0.9	0.09(c) *2.5*	0.02 *1.2*	0.05	2.2	0.2
20-year yield (a)	0.07(c) *2.0*	-0.02 *1.1*	0.05	2.3	0.0	-0.08 *0.5*	0.01 *0.2*	0.02	2.0	4.2	0.21(d) *4.2*	0.04 *1.6*	0.29	2.4	0.3	0.09(d) *3.1*	0.000 *0.0*	0.05	2.3	0.1
£ effective	0.16 *0.9*	-0.02 *0.2*	0.01	1.9	1.9	0.61 *1.4* [*0.9*]	-0.19 *1.0* [*1.3*]	0.12	1.8	12.9(d)	0.10 *0.4*	-0.04 *0.3*	0.01	1.1	0.1	0.18 *1.4*	-0.06 *0.9*	0.01	1.8	0.6
DM/£	0.004 *0.7*	-0.002 *0.6*	0.01	1.9	1.5	0.03(c) *2.6*	-0.004 *0.9*	0.25	1.6	0.4	-0.001 *0.2*	-0.000 *0.0*	0.00	1.2	0.6	0.01 *1.1*	-0.002 *0.9*	0.01	1.9	1.2
$/£	0.01 *1.5*	0.002 *0.8*	0.03	1.8	0.9	-0.000 *0.0*	-0.002 *0.2*	0.00	2.3	0.0	0.01 *1.1*	-0.002 *0.6*	0.03	1.8	0.0	0.01 *1.6*	0.000 *0.1*	0.01	1.9	0.1

Notes: N = Number of observations.
Conventional t-ratios are in italics.
T-ratios based on White heteroscedasticity-corrected standard errors are shown in square brackets where the H-test is significant at 5%.

(a) F-test for heteroscedasticity is from regressing the equation's squared errors on its squared fitted values.
(b) Sample starts January 1983.
(c) Significant at the 5% confidence level.
(d) Significant at the 1% confidence level.

Table 2
Asset price response to inflation news—equation (2)

$\Delta Y_t = \alpha+\beta(\pi-\pi^e)+ u_t$

	Sample 1.82–9.90 N = 105				Sample 10.90–9.92 N = 24				Sample 10.92–4.97 N = 55				Sample 1.82–4.97 N = 184			
	β	R^2	*DW*	*H* (a)	β	R^2	*DW*	*H* (a)	β	R^2	*DW*	*H* (a)	β	R^2	*DW*	*H* (a)
FT-SE 500	-2.45 *0.7*	0.01	1.7	1.4	10.48 *0.5*	0.01	2.3	0.1	-6.81 *0.6*	0.01	2.3	0.1	-2.30 *0.5*	0.00	2.2	0.0
3-month Libor	-0.05 *0.7*	0.00	1.9	0.2	-0.21 *1.5*	0.09	2.0	0.8	-0.03 *1.0*	0.02	2.1	2.6	-0.05 *1.1*	0.01	1.9	0.0
5-year yield (b)	0.08(c) *2.2*	0.05	2.3	1.6	-0.15 *0.8*	0.03	2.0	2.3	0.18(d) *3.5*	0.19	2.2	1.5	0.09(c) *2.5*	0.04	2.2	0.2
10-year yield (b)	0.07 *1.8*	0.03	2.1	0.4	-0.13 *0.7*	0.02	2.1	2.6	0.23(d) *4.1*	0.24	2.5	0.1	0.09(d) *2.7*	0.04	2.2	0.0
20-year yield (b)	0.06 *1.9*	0.04	2.3	0.7	-0.07 *0.5*	0.01	2.0	2.5	0.21(d) *4.3*	0.25	2.5	0.1	0.09(d) *3.1*	0.05	2.3	0.1
£ effective	0.16 *0.9*	0.01	1.9	2.0	0.58 *1.3* [*0.9*]	0.07	1.9	17.3(d)	0.10 *0.4*	0.00	1.1	0.1	0.17 *1.3*	0.01	1.8	0.9
DM/£	0.003 *0.6*	0.00	1.9	0.8	0.03(c) *2.5*	0.22	1.7	0.2	-0.001 *0.2*	0.00	1.2	0.6	0.004 *1.0*	0.01	1.9	0.6
$/£	0.01 *1.6*	0.02	1.8	0.8	0.001 *0.00*	0.00	2.3	1.4	0.01 *1.1*	0.02	1.8	0.0	0.01 *1.6*	0.01	1.9	0.1

Notes: N = Number of observations.
Conventional t-ratios are in italics.
T-ratios based on White heteroscedasticity-corrected standard errors are shown in square brackets where the H-test is significant at 5%.

(a) F-test for heteroscedasticity is from regressing the equation's squared errors on its squared fitted values.
(b) Sample starts January 1983.
(c) Significant at the 5% confidence level.
(d) Significant at the 1% confidence level.

Table 3
Asset price response to positive(+)/negative(-) inflation news—equation (3)

$\Delta Y_t = \alpha + \beta_+ D_+(\pi - \pi^e) + \beta\_D\_ (\pi - \pi^e) + u_t$

	Sample 1.82–9.90 N = 105					Sample 10.90–9.92 N = 24					Sample 10.92–4.97 N = 55					Sample 1.82–4.97 N = 184				
	β_+	$\beta\_$	R^2	*DW*	*H* (a)	β_+	$\beta\_$	R^2	*DW*	*H* (a)	β_+	$\beta\_$	R^2	*DW*	*H* (a)	β_+	$\beta\_$	R^2	*DW*	*H* (a)
FT-SE 500	-6.17 *1.2*	4.53 *0.6*	0.01	1.7	0.7	58.19 *1.1*	-18.2 *0.5*	0.05	2.3	1.3	-3.68 *0.1*	-8.38 *0.4*	0.01	2.3	0.0	-2.40 *0.3*	-2.16 *0.3*	0.00	2.2	0.0
3-month Libor	0.05 *0.5*	-0.23 *1.4*	0.02	1.9	0.0	-0.58 *1.6*	0.01 *0.0*	0.14	1.8	1.6	0.12 *1.6*	-0.10 *2.4*	0.10	2.0	0.2	0.03 *0.4*	-0.15 *1.7*	0.02	1.9	0.1
5-year yield (b)	0.11(c) *2.0*	0.02 *0.2*	0.05	2.3	0.8	-0.56 *1.2*	0.10 *0.3*	0.07	1.9	3.1	0.19 *1.4*	0.17(c) *2.1*	0.19	2.2	1.4	0.08 *1.4*	0.10 *1.4*	0.04	2.2	0.2
10-year yield (b)	0.09 *1.7*	0.01 *0.1*	0.04	2.1	0.1	-0.62 *1.5*	0.17 *0.6*	0.09	1.9	3.8	0.14 *1.0*	0.27(d) *3.0*	0.25	2.4	0.9	0.05 *0.9*	0.14(c) *2.1*	0.05	2.2	0.1
20-year yield (b)	0.10(c) *2.1*	-0.03 *0.3*	0.05	2.4	0.1	-0.44 *1.3*	0.15 *0.6*	0.07	1.8	3.7	0.10 *0.8*	0.26(d) *3.3*	0.26	2.4	0.4	0.06 *1.3*	0.13(c) *2.2*	0.06	2.3	0.1
£ effective	0.13 *0.5*	0.20 *0.5*	0.01	1.9	2.0	2.13(c) *2.0* *[1.6]*	-0.35 *0.5* *[0.4]*	0.18	1.6	5.9(c)	-0.45 *0.7*	0.37 *0.9*	0.02	1.1	0.0	0.14 *0.6*	0.20 *0.8*	0.01	1.8	0.8
DM/£	0.002 *0.2*	0.01 *0.5*	0.00	1.9	0.5	0.05 *1.9*	0.01 *0.7*	0.26	1.6	0.0	-0.02 *0.8*	0.01 *0.5*	0.01	1.2	2.7	0.002 *0.3*	0.01 *0.8*	0.01	1.9	0.5
$/£	0.01 *0.7*	0.01 *1.2*	0.03	1.8	1.6	0.06 *1.1* *[0.7]*	-0.03 *1.0* *[0.9]*	0.07	2.0	8.7(d)	-0.01 *0.2*	0.01 *1.2*	0.03	1.8	0.0	0.01 *0.9*	0.01 *0.9*	0.01	1.9	0.1

Notes: N = Number of observations.
Conventional t-ratios are in italics.
T-ratios based on White heteroscedasticity-corrected standard errors are shown in square brackets where the H-test is significant at 5%.

(a) F-test for heteroscedasticity is from regressing the equation's squared errors on its squared fitted values.
(b) Sample starts January 1983.
(c) Significant at the 5% confidence level.
(d) Significant at the 1% confidence level.

Table 4
Response of implied forward rates to news—equation (2)

$\Delta Y_t = \alpha + \beta(\pi - \pi^e) + u_t$

	Sample 4.82–9.90 N = 102				Sample 10.90–9.92 N = 24				Sample 10.92–4.97 N = 55				Sample 4.82–4.97 N = 181			
	β	R^2	*DW*	*H* (a)	β	R^2	*DW*	*H* (a)	β	R^2	*DW*	*H* (a)	β	R^2	*DW*	*H* (a)
2-year nominal (b)	0.03 *0.2*	0.00	1.7	0.5	-0.17 *0.7*	0.02	1.8	2.4	0.07 *1.1*	0.02	1.8	2.4	0.03 *0.3*	0.00	1.7	0.0
5-year nominal (b)	0.38(d) *3.6*	0.11	1.9	0.1	-0.04 *0.3*	0.00	2.2	1.7	0.29(d) *4.1*	0.24	2.3	0.0	0.31(d) *4.5*	0.10	1.9	0.2
10-year nominal (b)	-0.27 *1.8*	0.03	1.6	0.0	-0.02 *0.1*	0.00	2.8	1.5	0.30(d) *4.5* *[2.5]*	0.27	2.3	44.5(d)	-0.09 *1.0*	0.01	1.7	0.1
2-year real	-0.01 *0.1*	0.00	1.9	2.2	0.04 *0.3*	0.01	1.4	0.0	0.06 *1.4*	0.03	1.9	0.0	0.01 *0.3*	0.00	1.9	3.1
5-year real	0.04 *1.6*	0.02	1.8	0.9	-0.01 *0.1*	0.00	1.4	0.1	0.06(c) *2.0*	0.07	2.5	0.4	0.04 *1.9*	0.02	2.0	0.5
10-year real	0.06(d) *2.8*	0.08	1.8	0.1	0.001 *0.0*	0.00	1.4	0.3	0.02 *0.9*	0.02	2.0	0.3	0.04(c) *2.2*	0.03	2.0	0.0
2-year inflation	0.05 *0.4*	0.00	1.9	0.2	-0.22 *0.8*	0.02	1.8	2.4	0.01 *0.1*	0.00	1.9	0.0	0.03 *0.3*	0.00	1.9	0.0
5-year inflation	0.38(d) *3.3*	0.10	2.0	0.1	-0.03 *0.3*	0.00	1.6	1.5	0.23(d) *3.5*	0.18	2.4	0.1	0.29(d) *4.0*	0.08	2.0	0.3
10-year inflation	-0.36(c) *2.3*	0.05	1.5	0.0	-0.02 *0.1*	0.00	2.0	1.7	0.28(d) *4.2* *[2.2]*	0.25	2.3	54.9(d)	-0.15 *1.5*	0.01	1.6	0.1

Notes: N = Number of observations.
Conventional t-ratios are in italics.
T-ratios based on White heteroscedasticity-corrected standard errors are shown in square brackets where the H-test is significant at 5%.

(a) F-test for heteroscedasticity is from regressing the equation's squared errors on its squared fitted values.
(b) Sample starts January 1982.
(c) Significant at the 5% confidence level.
(d) Significant at the 1% confidence level.

Table 5
Response of implied forward rates to positive(+)/negative(-) inflation news—equation (3)

$\Delta Y_t = \alpha + \beta_+ D_+(\pi - \pi^e) + \beta_- D_- (\pi - \pi^e) + u_t$

	Sample 4.82–9.90 N = 102					Sample 10.90–9.92 N = 24					Sample 10.92–4.97 N = 55					Sample 4.82–4.97 N = 181				
	β_+	β_-	R^2	*DW*	*H* (a)	β_+	β_-	R^2	*DW*	*H* (a)	β_+	β_-	R^2	*DW*	*H* (a)	β_+	β_-	R^2	*DW*	*H* (a)
2-year nominal (b)	-0.19 *0.9*	0.45 *1.4*	0.02	1.7	0.3	-0.80 *1.4* *[1.0]*	0.21 *0.5* *[0.6]*	0.08	1.7	4.5(c)	0.09 *0.5*	0.07 *0.6*	0.02	1.8	2.6	-0.16 *1.0*	0.26 *1.5*	0.02	1.7	0.3
5-year nominal (b)	0.52(d) *3.3*	0.12 *0.5*	0.13	1.9	0.1	-0.26 *0.7*	0.09 *0.4*	0.03	2.1	3.3	0.25 *1.3*	0.30(d) *2.7*	0.24	2.3	0.1	0.45(d) *3.9*	0.14 *1.1*	0.11	1.9	0.0
10-year nominal (b)	-0.36 *1.6*	-0.10 *0.3*	0.03	1.6	0.0	-0.47 *0.9*	0.25 *0.7*	0.04	2.7	0.2	-0.14 *0.8* *[0.7]*	0.53(d) *5.1* *[2.9]*	0.36	2.2	20(d)	-0.37(c) *2.3*	0.24 *1.3*	0.03	1.6	0.1
2-year real	0.03 *0.4*	-0.07 *0.6*	0.00	1.9	0.6	0.38 *1.2*	-0.16 *0.7*	0.06	1.5	0.5	0.06 *0.5*	0.06 *0.8*	0.03	1.9	0.0	0.03 *0.5*	-0.01 *0.2*	0.00	1.9	0.0
5-year real	0.08(c) *2.2*	-0.04 *0.7*	0.05	1.9	0.0	-0.09 *0.4*	0.04 *0.3*	0.01	1.5	0.5	0.03 *0.4*	0.08 *1.6*	0.08	2.5	0.5	0.06 *1.8*	0.01 *0.3*	0.02	2.0	0.1
10-year real	0.08(c) *2.6*	0.02 *0.3*	0.08	1.9	0.1	-0.19 *0.7*	0.12 *0.6*	0.03	1.5	0.9	-0.000 *0.1*	0.04 *0.9*	0.02	1.9	0.2	0.05 *1.7*	0.02 *0.7*	0.03	2.0	0.0
2-year inflation	-0.20 *0.9*	0.57 *1.6*	0.03	1.9	0.3	-1.2 *1.7*	0.37 *0.8*	0.12	1.8	4.1	0.02 *0.1*	0.01 *0.0*	0.00	1.9	0.1	-0.17 *1.1*	0.27 *1.4*	0.01	1.9	0.3
5-year inflation	0.47(d) *2.8*	0.17 *0.6*	0.11	1.9	0.0	-0.17 *0.5*	0.05 *0.2*	0.01	1.5	1.7	0.22 *1.3*	0.23(c) *2.1*	0.18	2.4	0.1	0.42(d) *3.5*	0.13 *0.9*	0.09	2.0	0.0
10-year inflation	-0.44 *1.9*	-0.20 *0.5*	0.05	1.5	0.0	-0.28 *0.5*	0.13 *0.4*	0.01	1.9	0.0	-0.13 *0.8* *[0.7]*	0.49(d) *4.7* *[2.5]*	0.33	2.3	38(d)	-0.44(c) *2.6*	0.22 *1.1*	0.04	1.6	0.1

Notes: N = number of observations.
Conventional t-ratios are in italics.
T-ratios based on White heteroscedasticity-corrected standard errors are shown in square brackets where the H-test is significant at 5%.

(a) F-test for heteroscedasticity is from regressing the equation's squared errors on its squared fitted values.
(b) Sample starts January 1982.
(c) Significant at the 5% confidence level.
(d) Significant at the 1% confidence level.

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