Asset Price Reactions to RPI Announcements

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Abstract

This paper examines the same-day reaction of a variety of UK asset prices to monthly RPI inflation announcements over a sample period extending from the early 1980s until April 1997, the month before the Bank of England was given operational independence for setting interest rates. We decompose these announcements into their expected and unexpected, or 'news', components using survey data on financial analysts' inflation expectations and, as a cross-check, prediction errors from a time-series model of inflation. We find 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, and we find that this sensitivity was particularly marked after late 1992, when the UK adopted an explicit inflation target. The responsiveness of implied medium and long-term forward inflation rates (calculated from conventional and index-linked bonds) during the post-1992 period is consistent with the expected inflation hypothesis, a result that suggests that the pre-independence inflation-targeting framework was not seen as fully credible by the financial markets. Nevertheless, 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.

Keywords: Asset prices, inflation announcements, credibility.

JEL classification: E44, E52

1. Introduction

A large literature exists documenting the movement of financial asset prices in response to macroeconomic news, the most widely studied of these announcement effects being the impact of money supply figures in the United States.(1) There are two main reasons for interest in this subject (see eg Wachtel (1992)). The first is that it enables some assessment to be made of the efficiency of financial markets in processing information. Provided that the announced information can be decomposed into its expected and unexpected components, it is possible to test the prediction of the efficient markets hypothesis that asset prices only respond to the unexpected component of new data, or 'news'. The second reason is that the reaction of financial markets to news may tell us something about the markets' perception of the authorities' reaction function and, therefore, about the credibility of monetary policy. Measuring credibility provides the main motivation for this paper.

In what follows, we examine the same-day reaction of a variety of UK asset prices to monthly RPI inflation announcements, from the early 1980s until April 1997, the month before the granting of operational independence to the Bank of England. Our interest in credibility is the rationale for focusing on the reaction of financial markets to RPI inflation announcements rather than on some other macroeconomic variable.(2) Over the period we consider, the framework of UK monetary policy 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 some goal of low inflation remained the ultimate objective of policy. We might therefore expect financial markets to have been sensitive to inflation surprises throughout the period, though it seems plausible that the potential significance of inflation news may have increased after October 1992, when the United

(1) Money supply announcement effects became particularly apparent in the late 1970s, when the Federal Reserve changed its operating procedures (see eg Wachtel (1992)). Money announcements in the United Kingdom have been studied by Smith and Goodhart (1985), Tessaromatis (1990) and Peel, Pope and Paudyal (1990).

(2) 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).

Kingdom adopted an explicit inflation target. We examine this possibility by focusing on sub-samples of the data.

Clearly, the identification of RPI inflation news is critical to our analysis. For this paper, we have used survey data on financial market analysts' expectations of RPI inflation compiled by Money Market Services (MMS), which enable us to construct a consistent measure of inflation news back to the early 1980s.(3) This means that (unlike eg Fischer (1993)) we avoid the need to identify expectations using an econometric model of inflation. We do, however, use a time-series model as a cross-check on our main findings.

The literature on announcement effects suggests two main theories for why asset prices may respond to inflation news: the policy anticipations hypothesis (PAH) and the expected inflation hypothesis (EIH).(4) 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, ie raise/lower (real) interest rates. Of course, in the case of a forward-looking inflation target, it is not immediately clear that policy should react to *contemporaneous* inflation news: the implication here 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. The PAH can therefore be thought of as broadly consistent with monetary policy credibility, since it assumes that the authorities are committed to offsetting any underlying inflationary pressures signalled by unexpected rises/falls in measured inflation.(5) 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

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(3) The MMS series we use refers to the month-on-month percentage change in the Retail Price Index and goes back to December 1981.

(4) In his survey of the money announcements literature, Cornell (1983) distinguishes two further hypotheses, which we do not consider: a real activity hypothesis and a risk-aversion hypothesis.

(5) Full credibility would generally require the anticipated policy response to be sufficient to fully offset any future longer-term inflationary implications signalled by the news.

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 insufficiently to prevent a rise in expected inflation (consistent with the EIH).

As Fischer (1993) has pointed out, the symmetry assumption implicit in both theories, that the strength of market reaction to inflation news will be the same whether inflation news is higher or lower than expected, need not always hold, even if policy is viewed as fully credible. If, for example, the authorities are undershooting their target for inflation, then a positive inflation shock need not require any response (unchanged expected real rates and higher expected inflation), while a negative inflation shock may enable them to relax policy (lowering expected real rates, with ambiguous effects on expected inflation).(6) Nevertheless, by definition, such asymmetries would be consistent with credibility only if they were restricted to expectations over the shorter term (ie within the two to three-year period that monetary policy changes are likely to have their biggest impact on inflation).

Alternatively, asymmetries might arise where the authorities were in the process of building credibility. For example, if the authorities were

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(6) The discussion here and throughout this section abstracts from the impact on very short-term real rates. This could differ from the impact on longer-term rates, because the monetary authorities directly control very short-term nominal interest rates (typically at a two-week maturity) through their operations in the money market. So, given inflation persistence, a positive inflation shock may raise short-term inflation expectations and reduce short-term real rates over this short period, even if the authorities are expected to want to tighten policy as a result of the news (but do not react immediately). Beyond this horizon, however, nominal rates are market-determined and, unless the authorities are expected to move real rates, any rise in expected short-term inflation should be reflected one-for-one in higher nominal rates (in line with the Fisher equation—see footnote 7), other things being equal. In the empirical work reported in this paper, the shortest-maturity real rate we examine is a two-year forward rate, where this potentially perverse short-term effect should not matter materially. It might, however, affect our results for three-month Libor rates. We discuss this issue further in Section 4.1 below.

overshooting their inflation target but were committed to establishing the credibility of their policy, they might adopt a strategy of tightening policy in response to higher-than-expected inflation, but leaving policy unchanged if inflation turned out lower than expected. If this were understood by financial markets, then higher-than-expected RPI outturns would cause real rate expectations to rise (with inflation expectations unchanged), whereas lower-than-expected inflation would not trigger a change to real rates (though possibly improving the inflation outlook). We pay careful attention to asymmetric responses in our empirical analysis below in order to distinguish between these various possibilities.

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 (but see below). 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 (see Table 1.1).

Consider the case of nominal interest rates. If inflation turns out higher than expected, the PAH predicts that the nominal interest rates, at least at shorter maturities, will rise in response to higher expected real 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.(7) But this is also the prediction of the EIH, since

(7) 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.

Table 1.1: Expected reaction of asset prices to RPI inflation news

Assets	**Stock prices**	**Short-term nominal *spot* interest rates**	**Long-term nominal *forward* interest rates**	**Short-term real *spot* interest rates**	**Long-term real *forward* interest rates**	**Spot nominal exchange rates**
<u>Hypotheses:</u>						
Expected inflation	?	+	+	0	0	-
Policy anticipations	-	+	0	+	0	+

\+ rise/appreciation in response to higher-than-expected inflation (fall/depreciation in response to lower-than-expected inflation)

\- fall/depreciation in response to higher-than-expected inflation (rise/appreciation in response to lower-than-expected inflation)

? unclear or little impact

higher-than-expected inflation would be expected to raise future inflation expectations and thereby current short-term, as well as longer-term, nominal interest rates. In the case of the EIH, there may also be an additional effect through the impact of expected inflation on the inflation risk premium, but since the two are likely to be positively correlated, this effect acts in the same direction as higher expected inflation and so does not help in discriminating between the two hypotheses.[(8)] It is also possible that the inflation risk premium could rise independently of any change in the expected average level of inflation, reflecting a rise in 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 the problem, because real rates (and any real rate risk premium) are likely to be invariant to monetary policy at longer maturities, and so a 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 of whatever maturity 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 partial 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 rates, while the EIH predicts a depreciation in line with higher expected inflation (and hence a higher expected price level relative to overseas). We therefore give particular attention to the reaction of exchange rates and forward interest rates (derived by the Bank of England) to RPI news in our empirical analysis. But the existence of a market for index-linked government bonds (IGs) in the United Kingdom enables us to go one better, by comparing the differing reaction of conventional gilts and IGs to infer movements in real rates and expected inflation more directly.[(9)]

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(8) We are assuming here that the real interest rate risk premium will be invariant to a change in expected real rates (PAH) or to expected inflation (EIH).

(9) 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

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)) make explicit adjustment for these effects, and we use these data in our analysis. Of course, some problems remain with these data—notably, the impact of any inflation risk and liquidity premia are not directly identified—but as long as risk premia remain broadly constant on inflation announcement days, then the daily changes in the real/inflation rate measures we examine will not be seriously distorted.(10) 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, we also conduct our analysis in terms of a range of other asset price reactions.(11)

The rest of the paper is structured as follows. Section 2 sets out the empirical framework. The raw data and our measure of inflation expectations are discussed in Section 3. Our empirical results are set out in Section 4. Section 5 draws conclusions.

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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 the short end, movement in real 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.

(10) 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 does not seem implausible. And for reasons stated in the text, our analysis does not depend on this assumption.

(11) We have also examined the RPI 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.

2. 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:

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

where ΔY_t is the change in the relevant asset price/return between close of business on the working day prior to the RPI announcement and 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 Retail Price Index 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.

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

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

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

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

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 $\beta_+ = \beta_-$.[(12)]

Equations (**1**), (**2**) and (**3**) are potentially vulnerable to a problem of omitted variables. However, by focusing on the same-day movement in asset prices, we hope to minimise this problem and, provided any other relevant news on the day is orthogonal to 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 our empirical work runs from January 1982 to April 1997 but, given that this period saw major shifts in the framework of monetary policy, we break down the sample 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.

(12) 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.

3. Data

3.1 Inflation news

To assess the impact of unanticipated inflation on asset prices, we first need a measure of expected inflation. In this paper, we use survey data on expected RPI inflation provided by Money Market Services, which are available back to the early 1980s. The MMS data are based on a telephone survey each month 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.(13) Given publication lags, this refers to monthly RPI inflation in the previous month. The survey is normally conducted a week to a fortnight (the precise timing has varied) before the release of the RPI data.(14) We measure the inflation surprise as the difference between the actual monthly RPI outturn and the median estimate from the MMS survey.(15)

Of course, the United Kingdom's inflation target since October 1992 has been couched in terms of RPIX rather than RPI inflation, but the main virtue of using RPI expectations as the basis for our measure of inflation news throughout is that it 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

(13) Since the RPI is not seasonally adjusted, the monthly percentage change figures will be affected by seasonality and, as we shall see below, it is unclear whether the respondents to the MMS survey adequately account for this. In principle, using data on expectations for annual RPI inflation would be better, but these data are only available over a relatively short sample period.
(14) Ideally, we would want to measure expected inflation immediately prior to the release of the RPI data, so that expectations incorporate all the relevant information available up to that point and the measured news element is orthogonal to the current information set. If we assume efficient markets, then any relevant 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 is potentially 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.
(15) Since RPI data are never revised, the problem of data revisions does not arise.

much of the sample period covered by the analysis, it is unclear whether or not RPI news is the more relevant variable from our perspective.

Given the importance of our news measure for the analysis, it is of some interest to examine whether the underlying MMS data on RPI inflation expectations satisfy rationality, since if they do not, this raises the question of whether the data actually represent the consensus opinion of the market as a whole, which is usually assumed to be rational. We therefore follow the normal practice of testing for unbiasedness and (weak) efficiency, which are both requirements for rationality to hold.

A standard test of *unbiasedness* is to regress actual inflation (π_t) on expected inflation ($\pi_t^e{}_{\text{MMS}}$):[16]

$$\pi_t = \alpha + \beta\, \pi_t^e{}_{MMS} + u_t \qquad \textbf{(4)}$$

If the MMS data are unbiased forecasts of RPI inflation, then we expect α=0 and β=1 and u_t to be serially uncorrelated. The estimated version of this equation over the full sample and each sub-period is reported in Table 3.1 below:

Table 3.1: Tests for unbiasedness

	Sample: 1.82 - 9.90	Sample: 10.90 - 9.92	Sample: 10.92 - 4.97	Sample: 1.82 - 4.97
α	-0.014 (0.4)	-0.036 (0.7)	-0.038 (1.2)	-0.027 (1.3)
β	1.061 (21.9)	1.033 (11.4)	1.02 (14.3)	1.058 (29.9)
R^2	0.82	0.86	0.79	0.83
DW	1.91	1.58	2.11	1.94
LM (12)	12.81 [0.38]	14.08 [0.30]	14.65 [0.26]	15.99 [0.19]
$\chi^2(2)$:(α,β)=(0,1)	2.07 [0.36]	0.57 [0.75]	1.80 [0.41]	2.77 [0.25]

t-statistics are in normal brackets and *p*-values in square brackets.

The regressions reported in Table 3.1 reveal no evidence of serial correlation, and the joint hypothesis (α, β) = (0, 1) cannot be rejected at the five percent level for the full sample and each of the sub-periods. We conclude therefore that the MMS forecasts are unbiased. As a weak-form

(16) This assumes that inflation is stationary.

test of *efficiency,* we examine whether the forecast error (π-$\pi_t^e{}_{MMS}$) can be explained by past values of inflation. We therefore run the following regression

$$\pi_t - \pi_t^e{}_{MMS} = \alpha + \beta_1 \pi_{t-1} + \beta_2 \pi_{t-2} + ... + \beta_{12} \pi_{t-12} + e_t$$
(5)

and test the hypothesis (β_1, β_2, ..., β_{12}) = (0, 0, ... 0). The estimated version of (**5**) gives:

Table 3.2: Tests for efficiency

	Sample: 1.82 - 9.90	Sample: 10.90 - 9.92	Sample: 10.92 - 4.97	Sample: 1.82 - 4.97
R^2	0.19	0.35	0.19	0.12
DW	2.01	1.71	2.20	2.05
LM (12)	16.93 [0.15]	0.35 [0.56]	19.97 [0.07]	14.39 [0.28]
Ftest:(β_i)=(0)	1.79 [0.06]	0.49 [0.89]	0.80 [0.65]	1.99* [0.03]

*Rejected at the 5% (but not 1%) confidence level.

On the basis of the F-statistic, the null hypothesis that expectations are efficient is rejected at the 3% level over the full sample and at the 6% level for the first sub-period, but not for either the ERM period or for the period under inflation targeting. One explanation for the finding of weak inefficiency in part of the sample may be that survey participants did not fully take into account seasonality, because the inclusion of the twelfth lag of monthly inflation reduces the expectations error. In fact, these seasonal effects appear to be largely explained by Budget tax changes, because the inclusion of a Budget dummy into the regression eliminates the statistical significance of the seasonal lag. Since efficiency is in any case only marginally rejected in the first sub-period, we use the raw data in our analysis rather than attempting to adjust the MMS measure for Budget/seasonal effects; all of the main results reported in Section 4 were nevertheless separately tested for robustness to the inclusion of additive and interactive Budget dummy variables.(17)

(17) We also examined the sensitivity of our results to three large outliers in the data (forecast errors of 1%, 0.8% and 0.6%), which we suspect (though we cannot be sure) may be due to reporting errors. But since none of our main conclusions are sensitive to whether

As a further check on the survey data, we compared their forecast accuracy over each subsample with the one step ahead predictions from a simple time-series model of monthly RPI inflation ($\pi_t^e{}_{AR}$)[(18)], which included the first twelve lags of inflation and seasonal dummy variables as regressors and was estimated recursively over the sample period (see Table 3.3).

Table 3.3 Comparison of forecast and actual inflation

	Sample: 1.82 - 9.90		Sample: 10.90 - 9.92		Sample: 10.92 - 4.97		Sample: 1.82 - 4.97	
mean μ (%) and standard deviation σ								
	μ	σ	μ	σ	μ	σ	μ	σ
π	0.48	0.51	0.34	0.45	0.21	0.41	0.38	0.49
$\pi^e{}_{MMS}$	0.46	0.44	0.36	0.41	0.24	0.36	0.38	0.42
$\pi^e{}_{AR}$	0.53	0.48	0.47	0.46	0.25	0.37	0.44	0.46
correlation with actual inflation π								
$\pi^e{}_{MMS}$	0.91		0.93		0.89		0.91	
$\pi^e{}_{AR}$	0.75		0.79		0.60		0.74	
standard deviation of forecast errors								
$\pi - \pi^e{}_{MMS}$	0.22		0.17		0.19		0.20	
$\pi - \pi^e{}_{AR}$	0.35		0.30		0.35		0.34	

these observations are dummied out or not, we only report the results using all the available data.

(18) In estimating the model, we pre-adjusted our measure of monthly RPI inflation for the impact effect of two large Budget tax changes, using estimates taken from the Department of Employment Gazette. Thus the monthly inflation figures for May 1975 and July 1979 were reduced by 2.5 percentage points and 3.1 percentage points respectively.

From Table 3.3, it is clear that the MMS forecasts of inflation perform far better than those of the time-series model. Over the full sample and each sub-period, the MMS median expectation is more closely correlated with the final outturn than the forecast from the autoregressive model, and its associated forecast errors have a smaller variance.

3.2 Asset price data

We examine the reaction of a range of financial market prices to RPI announcements, including share prices, interest rates and exchange rates, as well as movements in the estimated forward interest rate term structure for UK government bonds, decomposed into their implied real and inflation components.(19) Full definitions of each of these variables are contained in Table 3.4 below.

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. The descriptive statistics for these variables are presented in Tables 3.5 and 3.6. Table 3.5 suggests that the majority of asset prices exhibited their greatest variability over the ERM period, a conclusion that remains robust to the exclusion of large movements on the dates of the United Kingdom's entry and exit. The main message that emerges from Table 3.6 is that implied nominal, real and inflation forward 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.

(19) Data from the Bank of England's daily estimated interest rate term structure; see Deacon and Derry (1994a) and (1994b). Of course, the calculation of these implied forward real rates and inflation rates is subject to a number of caveats (see Section 1).

Table 3.4 Asset price data definitions

FT-SE 500 price index	Jan 1962 = 100
Three-month Libor rate	Per cent per annum
5, 10, 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 nominal forward rates	Per cent per annum
2, 5 and 10-year real forward rates	Per cent per annum
2, 5 and 10-year inflation forward rates	Per cent per annum

Table 3.5 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
three-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 3.6: 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.

4. Results

4.1 Asset prices

The starting-point for our empirical analysis is equation **(1)**, from Section 2. Table 4.1 reports the results from running this regression for each of our asset prices over the full sample and each sub-period. In each case, we find that expected RPI inflation does not explain movements in asset prices on the day of RPI announcements (the hypothesis $\beta_2 = 0$ cannot be rejected at the 5% confidence level). This suggests that asset markets are efficient with respect to inflation announcements, in the sense that (if anything) only the unexpected component of the announcement is correlated with asset price changes. For reasons of space, we shall hereafter only report the results for equations **(2)** and **(3)**, which exclude the term for expected

Table 4.1
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	0.78	0.01	1.7	2.3	12.08	-8.74	0.05	2.1	0.0	-6.06	-10.13	0.06	2.2	1.0	-1.61	-2.75	0.01	2.2	0.0
	0.8	*0.5*				*0.6*	*0.9*				*0.5*	*1.7*				*0.4*	*1.3*			
3-month Libor	-0.04	-0.04	0.02	1.9	0.8	-0.21	-0.01	0.09	2.0	0.4	-0.03	-0.03	0.05	2.2	3.8	-0.05	-0.03	0.01	1.9	0.0
	0.5	*1.1*				*1.4*	*0.2*				*1.0*	*1.4*				*1.0*	*1.2*			
5-year yield (a)	0.09(b)	-0.01	0.05	2.3	1.1	-0.16	0.03	0.04	1.9	3.7	0.18(d)	0.04	0.22	2.1	1.4	0.08(c)	0.01	0.04	2.2	0.3
	2.3	*0.6*				*0.8*	*0.4*				*3.5*	*1.6*				*2.4*	*0.5*			
10-year yield (a)	0.06	0.01	0.04	2.1	0.8	-0.13	0.03	0.03	2.0	4.4(c)	0.22(d)	0.04	0.27	2.4	0.9	0.09(c)	0.02	0.05	2.2	0.2
	1.7	*0.5*				*0.8*	*0.4*				*4.1*	*1.4*				*2.5*	*1.2*			
						[*0.6*]	[*0.5*]													
20-year yield (a)	0.07(c)	-0.02	0.05	2.3	0.0	-0.08	0.01	0.02	2.0	4.2	0.21(d)	0.04	0.29	2.4	0.3	0.09(d)	0.000	0.05	2.3	0.1
	2.0	*1.1*				*0.5*	*0.2*				*4.2*	*1.6*				*3.1*	*0.0*			
£ effective	0.16	-0.02	0.01	1.9	1.9	0.61	-0.19	0.12	1.8	12.9(d)	0.10	-0.04	0.01	1.1	0.1	0.18	-0.06	0.01	1.8	0.6
	0.9	*0.2*				*1.4*	*1.0*				*0.4*	*0.3*				*1.4*	*0.9*			
						[*0.9*]	[*1.3*]													
DM/£	0.004	-0.002	0.01	1.9	1.5	0.03(c)	-0.004	0.25	1.6	0.4	-0.001	-0.000	0.00	1.2	0.6	0.01	-0.002	0.01	1.9	1.2
	0.7	*0.6*				*2.6*	*0.9*				*0.2*	*0.0*				*1.1*	*0.9*			
$/£	0.01	0.002	0.03	1.8	0.9	-0.000	-0.002	0.00	2.3	0.0	0.01	-0.002	0.03	1.8	0.0	0.01	0.000	0.01	1.9	0.1
	1.5	*0.8*				*0.0*	*0.2*				*1.1*	*0.6*				*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 1983.
(c) Significant at the 5% confidence level.
(d) Significant at the 1% confidence level.

inflation—assuming, in other words, that only the news element of the RPI announcement affects asset prices. These results are reported in Tables 4.2 and 4.3 respectively.

What emerges clearly from Table 4.2 is that government bond yields show the most sensitivity to unanticipated inflation. This response is particularly marked in both size and statistical significance over 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 discussed in Section 3.1; see Table 4.2a in the Annex.) Over the period since October 1992, the estimated β coefficients imply that a monthly RPI inflation outturn that was 1 percentage point higher-than-expected would accompany an announcement-day rise in 5, 10 and 20-year 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. Comparing the results in Table 4.2 with Table 4.3, which shows the same regression with news disaggregated into positive and negative components, suggests that there is an asymmetric response, with only the response to lower-than-expected inflation being statistically significant at conventional levels, and the absolute size of the response to lower-than-expected inflation being larger at the longer (10 and 20-year) maturities.

There is also some evidence that bond yields responded to inflation news in the pre-ERM period. In Table 4.2, 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, there are strong asymmetries when the regressions are re-run disaggregating news into positive and negative components, but in this case it appears that yields responded more sharply when inflation was higher than expected. For reasons given in Section 1, we cannot draw direct inferences from these results for the validity of either the PAH or the EIH, although the responsiveness of long bond yields in both periods seems more likely to be consistent with the latter.

The only other asset prices to have shown any significant response to inflation news over the sample were the DM/£ rate (Table 4.2) and the

Table 4.2
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 4.3
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_+	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)
FT-SE 500	-6.17	4.53	0.01	1.7	0.7	58.19	-18.2	0.05	2.3	1.3	-3.68	-8.38	0.01	2.3	0.0	-2.40	-2.16	0.00	2.2	0.0
	1.2	*0.6*				*1.1*	*0.5*				*0.1*	*0.4*				*0.3*	*0.3*			
3-month Libor	0.05	-0.23	0.02	1.9	0.0	-0.58	0.01	0.14	1.8	1.6	0.12	-0.10	0.10	2.0	0.2	0.03	-0.15	0.02	1.9	0.1
	0.5	*1.4*				*1.6*	*0.0*				*1.6*	*2.4*				*0.4*	*1.7*			
5-year yield (b)	0.11(c)	0.02	0.05	2.3	0.8	-0.56	0.10	0.07	1.9	3.1	0.19	0.17(c)	0.19	2.2	1.4	0.08	0.10	0.04	2.2	0.2
	2.0	*0.2*				*1.2*	*0.3*				*1.4*	*2.1*				*1.4*	*1.4*			
10-year yield (b)	0.09	0.01	0.04	2.1	0.1	-0.62	0.17	0.09	1.9	3.8	0.14	0.27(d)	0.25	2.4	0.9	0.05	0.14(c)	0.05	2.2	0.1
	1.7	*0.1*				*1.5*	*0.6*				*1.0*	*3.0*				*0.9*	*2.1*			
20-year yield (b)	0.10(c)	-0.03	0.05	2.4	0.1	-0.44	0.15	0.07	1.8	3.7	0.10	0.26(d)	0.26	2.4	0.4	0.06	0.13(c)	0.06	2.3	0.1
	2.1	*0.3*				*1.3*	*0.6*				*0.8*	*3.3*				*1.3*	*2.2*			
£ effective	0.13	0.20	0.01	1.9	2.0	2.13(c)	-0.35	0.18	1.6	5.9(c)	-0.45	0.37	0.02	1.1	0.0	0.14	0.20	0.01	1.8	0.8
	0.5	*0.5*				*2.0*	*0.5*				*0.7*	*0.9*				*0.6*	*0.8*			
						[1.6]	*[0.4]*													
DM/£	0.002	0.01	0.00	1.9	0.5	0.05	0.01	0.26	1.6	0.0	-0.02	0.01	0.01	1.2	2.7	0.002	0.01	0.01	1.9	0.5
	0.2	*0.5*				*1.9*	*0.7*				*0.8*	*0.5*				*0.3*	*0.8*			
$/£	0.01	0.01	0.03	1.8	1.6	0.06	-0.03	0.07	2.0	8.7(d)	-0.01	0.01	0.03	1.8	0.0	0.01	0.01	0.01	1.9	0.1
	0.7	*1.2*				*1.1*	*1.0*				*0.2*	*1.2*				*0.9*	*0.9*			
						[0.7]	*[0.9]*													

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.

£ effective rate (Table 4.3) during the United Kingdom's ERM membership. These results appear consistent with the PAH (Table 1.1), 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: the results in Table 4.3 suggest that sterling showed no tendency to depreciate relative to the currencies of its trading partners if UK inflation turned out lower than anticipated. One possible interpretation of these results is that the authorities were perceived to be overshooting their (implicit) inflation target over this period and were therefore thought likely to accommodate lower-than-expected inflation, while tightening in response to higher-than-expected inflation. However, given the short sample, we need to be particularly cautious in interpreting these results. Moreover, their statistical significance is sensitive to the inclusion of dummy variables for April 1992 (which coincided with a general election) and September 1992 (the United Kingdom's ERM exit).[20]

The responses to RPI news of the FT-SE 500 index, three-month Libor rate and $/£ rate are all statistically insignificant over each sub-period examined. The fact that three-month interest rates do not respond to inflation news is consistent with previous work (see eg Goodhart and Smith (1985) for the United Kingdom, and Urich and Wachtel (1984) or Roley and Troll (1983) for the United States), though it represents something of a puzzle over 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.

Also relevant in explaining these results could be the possibility that movements in the three-month rate may be affected by perverse movements in very short-term real rates (as discussed in footnote 6 in Section 1). Thus, for example, higher-than-expected inflation in the previous month might be expected to continue over the short term, thereby reducing ultra-short real rates, even if (as under the PAH) the authorities are expected to want to act (but not instantaneously) to raise nominal and hence real rates. This effect reflects the fact that nominal rates at very short maturities are controlled by the monetary authorities, through their dealings in the money

(20) When dummy variables for both these dates are included, the response coefficient in the DM/£ regression has a t-ratio of 1.7.

market. Since three-month rates are market-determined, any perverse reaction of
ultra-short real rates would also be expected to feed into their determination. So for this example of higher-than-expected inflation (the results obviously carry through with the opposite sign when inflation is lower than expected), the fall in ultra-short real rates could conceivably partly offset the impact on nominal three-month rates of higher expected inflation, and higher real rates for maturities 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 in Table 4.2 are negatively signed, but, of course, this does not establish the validity of the argument.

4.2 Inflation term structure

Though Tables 4.2 and 4.3 suggest fairly unambiguously that gilts react to RPI inflation shocks, and that their responsiveness increased sharply during the period when the United Kingdom explicitly targeted inflation, whether we 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 Section 1 noted, 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 interest rate term structure is potentially useful, because it provides explicit, though not unproblematic,[21] measures of expected inflation and real interest rates. Moreover, 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. Tables 4.4 and

(21) We have already discussed the problems of risk premia in Section 1. An additional potential problem arises from the fact that the current level of the RPI is not known at each point in time, due to reporting lags. This implies that some estimate has to be made of the current price level in order to calculate the real yield curve and implied inflation term structure, and this estimate may not accord with that of the market. To the extent that the former is revised according to the latest RPI announcement, this raises the possibility that estimated real yields and inflation spot rates will change because of a purely statistical effect from the RPI announcement itself, whether or not it contains any economic 'news' about the future. However, the extent of any impact is likely to be inversely related to the maturity of the yield, so the phenomenon will primarily affect the short end of the term structure and it is very unlikely that it materially affects forward rates, particularly those at longer maturities, which we examine in this paper.

4.5 therefore report results from regressions of announcement-day changes in implied nominal forward rates, forward inflation rates and forward real rates. (The corresponding regressions with inflation news derived from the times-series model described in Section 3.1 are set out in Tables 4.4a and 4.5a in the Annex. The principal conclusions drawn below are also consistent with these results.)

The results in Table 4.4 show that the sensitivity of nominal forward rates to inflation news follows a similar pattern to that for benchmark 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, while 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 (like that of benchmark spot yields) be consistent with either the EIH or the PAH (or some combination). However, the fact that forward nominal rates respond to inflation news more at longer than at shorter maturities suggests that these movements primarily reflect changes in expected inflation rather than changes in expected real rates, and the regressions for implied forward real rates and inflation rates seem to support this interpretation. Despite implied forward real rates at the five-year maturity showing 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 while 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 over the longer term. As discussed in Section 1, this change in inferred inflation expectations might reflect a revised view of the extent of incipient inflationary pressures or

Table 4.4
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 4.5
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.

risks[22] 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 inflation expectations hypothesis.

These results suggest that the post-1992 inflation-targeting framework lacked full credibility. Further insights into this emerge from the asymmetric results reported in Table 4.5, which show that during the inflation-targeting period, longer-term expected inflation, both at five and ten-year horizons, responded significantly to RPI announcements only when inflation outturns proved lower than expected. One interpretation of this asymmetry is that it reflected a period in which the authorities were in the process of building up credibility for the new monetary framework. Thus the markets required evidence of lower-than-expected inflation to revise down their long-term inflation expectations towards the stated target. However, this result is sensitive to one large downward movement on 12 February 1993 and so this interpretation is necessarily tentative.[23]

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.[24] (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

(22) As discussed in Section 1, 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 either explanation would not be consistent with monetary policy credibility.

(23) 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...',

(24) For example, regression results for the change in five-year inflation forwards are (t-ratios in square parentheses):

Sample: 92:10 to 94:12 $\Delta Y_t = 0.008 + 0.34\ [3.6]\ (\pi - \pi^e)$; $R^2 = 0.34$, DW=1.8, H=0.3

Sample: 95:1 to 97:4 $\Delta Y_t = 0.004 + 0.035\ [0.4]\ (\pi - \pi^e)$; $R^2 = 0.01$, DW=2.8, H=1.3

uncertain as to the authorities' intentions. So in addition to the various measures introduced to increase the openness and transparency of the monetary framework,[25] lower-than-expected RPI outturns seem to have been needed to demonstrate the authorities' sincerity with respect to the inflation target. As more information accumulated on the operation of the framework, and the confidence of financial markets in the authorities' commitment to low inflation increased, our results suggest that yields stopped responding to short-term inflation news. It is difficult 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 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 conceived 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 short sample size and fragility of the results would make us reluctant 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 if anything at the longer ten-year maturity they appear 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 that the authorities would not want to respond to higher-than-expected inflation outcomes in the short term, but would be forced to react in the medium term, though not by enough to prevent inflation rising. Certainly, these results seem difficult to reconcile with policy being fully credible during 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

(25) Of these measures, the most important were probably the publication of the Bank of England's quarterly *Inflation Report* (since February 1993) and the decision to publish the minutes of the monthly Chancellor-Governor meetings (from April 1994).

of this period.[26] When the results are re-run excluding the earlier part of the sample up to March 1984, none of the implied forward inflation rates appear to respond significantly to inflation news, an outcome apparently consistent with monetary policy credibility.[27] One perhaps more plausible explanation could simply be that inflation surprises carried less information for future inflation pre-1992, reflecting higher average inflation and inflation uncertainty, and the fact that the authorities had no explicit inflation target. Table 3.3 shows that during 1982-90, monthly inflation averaged around 0.48% compared with 0.21% between 1992-1997, and that inflation was considerably more volatile. Given this environment, it could have been quite consistent with rational behaviour for financial markets to have placed less weight on short-term inflation movements and therefore for asset prices to have exhibited less sensitivity to RPI news.

5. Summary and conclusions

In this paper, we examine the same-day reaction of a variety of asset prices to monthly RPI announcements over 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, we find gilts to be the most sensitive to the RPI announcements, with the responsiveness coefficient largest and most statistically significant during the post-1992 period of inflation targeting. Consistent with market efficiency, we find that gilt yield movements only occurred in response to the unexpected (news) component of RPI announcements.

We interpret these movements 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 rate expectations. During the

(26) In June 1982, for example, IGs represented only 4% of the outstanding stock of Government bonds.
(27) The results for five-year and ten-year real rates are broadly the same as for the longer sample. However, taking the results for *nominal* forward rates on their own would suggest that policy lacked credibility, since the (statistically significant) responsiveness of rates at the five-year maturity seems *a priori* more likely to be due to an expected inflation effect than the anticipation of higher future real rates.

period of inflation targeting, we find that movements in implied forward nominal rates at the longer end of the yield curve reflect changes in forward inflation rates, consistent with an inflation expectations effect. But we also find some evidence of an asymmetric response to inflation news, with inflation expectations appearing to fall in response to lower-than-expected RPI outturns, but not rising in the event of higher-than-expected inflation. Moreover, our 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, we argue 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 downwards towards the explicit target. However, the declining responsiveness of bond yields and implied forward inflation rates to inflation news over the period of operation of the framework does suggest that its credibility improved over time.

Annex - Selected results using news derived from time-series model

As a cross-check on the results reported in the main text, we also re-ran the same regressions using a measure of inflation news derived on the basis of the simple time-series model of inflation described in Section 3. In qualitative terms, the results are broadly similar to those based on the MMS-derived news measure. As can be seen from Table 4.2a, bond yields only show a positive, statistically significant response to inflation news over the period of inflation targeting. Moreover, as shown in Table 4.3a, this result seems to reflect the impact of lower-than-expected rather than higher-than-expected news on inflation. Tables 4.4a and 4.5a show the regression results when forward real rates and forward inflation rates are regressed on inflation news, and suggest that the latter rather than the former are more sensitive to inflation news.

Table 4.2a Bond yield response to inflation news derived from time-series model - equation (2)

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

	Sample: 1.83 - 9.90 N = 93				Sample: 10.90 - 9.92 N = 24				Sample: 10.92 - 4.97 N = 55				Sample: 1.82 - 4.97 N = 172			
	β	R^2	*DW*	$H^{(a)}$	β	R^2	*DW*	$H^{(a)}$	β	R^2	*DW*	$H^{(a)}$	β	R^2	*DW*	$H^{(a)}$
5-yr yld	0.002	0.0	2.3	0.3	-0.04	0.01	2.0	0.6	0.07[b]	0.10	2.1	1.4	0.02	0.01	2.2	0.0
	0.1	0			*0.4*				*2.4*				*1.0*			
10-yr yld	0.02	0.0	2.0	0.1	-0.05	0.01	2.1	0.5	0.08[c]	0.12	2.3	0.3	0.03	0.01	2.2	0.0
	0.6	0			*0.5*				*2.7*				*1.6*			
20-yr yld	-0.001	0.0	2.3	3.2	-0.04	0.01	2.0	0.5	0.08[c]	0.14	2.3	0.1	0.02	0.01	2.3	2.3
	0.0	0			*0.5*				*2.9*				*1.3*			

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 heteroscedasiticity is from regressing the equation's squared errors on its squared fitted values.
(b) Significant at the 5% confidence level.
(c) Significant at the 1% confidence level.

Table 4.3a Bond yield response to positive(+) /negative(-) inflation news derived from time-series model - equation (3)

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

	Sample: 1.83 - 9.90 N = 93					Sample: 10.90 - 9.92 N = 24					Sample: 10.92 - 4.97 N = 55					Sample: 1.83 - 4.97 N = 172				
	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	$H^{(a)}$
5-yr yld+	-0.02 *0.5*	0.03 *0.6*	0.0 0	2.3	0.3	0.33 *0.9*	-0.13 *0.9*	0.0 5	1.9	0.0	0.05 *0.8*	0.09 *1.8*	0.1 0	2.1	1.9	0.02 *0.4*	0.02 *0.7*	0.0 1	2.2	0.1
10-yr yld+	0.01 *0.3*	0.02 *0.4*	0.0 0	2.0	0.0	0.38 *1.1*	-0.16 *1.2*	0.0 9	2.0	0.1	0.03 *0.5*	0.12[b] *2.4*	0.1 4	2.3	0.7	0.04 *0.9*	0.03 *0.8*	0.0 1	2.2	0.0
20-yr yld+	-0.02 *0.6* [0.5]	0.02 *0.5* [0.4]	0.0 0	2.3	4.7[b]	0.36 *1.3*	-0.14 *1.4*	0.1 1	1.9	0.1	0.04 *0.7*	0.11[b] *2.5*	0.1 5	2.3	0.0	0.02 *0.4*	0.03 *1.0*	0.0 1	2.3	1.9

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 heteroscedasiticity is from regressing the equation's squared errors on its squared fitted values.
(b) Significant at the 5% confidence level.
(c) Significant at the 1% confidence level.

Table 4.4a Response of forward rates to news derived from time-series model - 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-yr nom(b)	0.002	0.00	1.7	2.6	-0.15	0.05	1.8	0.4	0.04	0.03	1.7	1.0	0.00	0.00	1.8	1.2
	0.0				*1.1*				*1.2*				*0.0*			
5-yr nom(b)	0.04	0.00	1.9	2.9	0.03	0.01	2.2	0.0	0.10(c)	0.11	2.1	0.0	0.06	0.01	1.9	1.2
	0.6				*0.3*				*2.5*				*1.4*			
10-yr nom(b)	-0.08	0.01	1.6	2.5	-0.11	0.04	2.8	0.2	0.14(d)	0.20	2.1	19.9(d)	-0.02	0.00	1.7	2.7
	0.8				*0.9*				*3.6* *[2.2]*				*0.3*			
2-yr real	-0.01	0.00	1.9	0.0	0.01	0.00	1.4	0.5	0.01	0.00	1.9	0.8	-0.01	0.00	1.9	0.0
	0.4				*0.1*				*0.3*				*0.3*			
5-yr real	0.01	0.01	1.8	1.3	0.02	0.01	1.4	0.5	0.01	0.00	2.4	0.4	0.01	0.00	1.9	1.3
	0.8				*0.4*				*0.4*				*0.8*			
10-yr real	0.02	0.03	1.7	0.4	0.03	0.01	1.4	0.4	0.00	0.00	1.9	2.0	0.01	0.01	1.9	0.2
	1.7				*0.5*				*0.0*				*1.2*			
2-yr infl	0.07	0.01	1.9	0.1	-0.16	0.04	1.8	0.3	0.04	0.02	1.9	0.4	0.04	0.00	1.9	0.0
	0.8				*1.0*				*1.0*				*0.7*			
5-yr infl	0.07	0.01	2.0	0.6	0.01	0.00	1.6	0.1	0.10(c)	0.12	2.2	0.0	0.07	0.01	2.0	0.1
	0.9				*0.1*				*2.6*				*1.6*			
10-yr infl	-0.12	0.01	1.6	3.0	-0.14	0.06	2.0	0.7	0.14(d)	0.21	2.1	24.0(d)	-0.04	0.00	1.6	1.8
	1.2				*1.2*				*3.8* *[2.1]*				*0.6*			

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 heteroscedasiticity 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 4.5a Response of implied forward rates to positive (+)/negative (-) inflation news derived from time-series model - 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-yr nom(b)	-0.26 *1.6*	0.25 *1.6*	0.03	1.7	0.0	0.38 *0.8*	-0.28 *1.6*	0.11	1.7	0.1	0.06 *0.9*	0.03 *0.5*	0.03	1.7	1.2	-0.11 *1.0*	0.09 *1.0*	0.01	1.8	0.0
5-yr nom(b)	0.04 *0.3*	0.05 *0.4*	0.00	1.9	2.9	0.38 *1.4*	-0.06 *0.6*	0.08	2.1	0.0	0.04 *0.5*	0.15[c] *2.3*	0.12	2.1	0.5	0.05 *0.6*	0.07 *0.9*	0.01	1.9	1.1
10-yr nom(b)	0.14 *0.8*	-0.29 *1.7*	0.03	1.6	1.9	0.87 *2.3*	-0.35 *2.6*	0.29	2.5	0.1	0.03 *0.5* *[0.4]*	0.21[d] *3.5* *[1.8]*	0.24	2.2	29.0[d]	0.12 *1.1*	-0.12 *1.3*	0.01	1.7	0.4
2-yr real	0.05 *0.9*	-0.08 *1.4*	0.02	1.9	1.0	0.02 *0.1*	0.05 *0.1*	0.00	1.4	0.1	0.00 *0.0*	0.01 *0.3*	0.00	1.9	0.6	0.03 *0.6*	-0.03 *0.9*	0.01	1.9	.03
5-yr real	0.03 *0.9*	-0.003 *0.1*	0.01	1.8	0.0	0.02 *0.1*	0.02 *0.3*	0.01	1.4	0.4	-0.04 *1.4*	0.04 *1.7*	0.07	2.4	0.7	-0.001 *0.1*	0.02 *0.9*	0.00	1.9	0.8
10-yr real	0.004 *0.2*	0.04 *1.6*	0.03	1.8	0.1	0.10 *0.4*	0.02 *0.2*	0.02	1.4	0.0	-0.03 *1.1*	0.02 *1.0*	0.03	1.9	0.2	-0.01 *0.3*	0.03 *1.6*	0.02	1.9	0.0
2-yr infl	-0.37 *2.3*	0.53 *3.2*	0.10	1.9	0.0	0.37 *0.6*	-0.29 *1.3*	0.08	1.7	0.1	0.06 *0.8*	0.02 *0.3*	0.02	1.8	0.4	-0.16 *1.5*	0.21 *2.1*	0.03	1.9	0.0
5-yr infl	-0.01 *0.1*	0.15 *1.1*	0.01	2.0	0.1	0.36 *1.3*	-0.08 *0.8*	0.08	1.6	0.3	0.09 *1.2*	0.10 *1.7*	0.12	2.2	0.1	0.04 *0.5*	0.10 *1.3*	0.02	2.0	0.0
10-yr infl	0.16 *0.8*	-0.41 *2.2*	0.05	1.7	3.0	0.77 *2.1*	-0.37 *2.7*	0.29	1.7	0.1	0.06 *0.9* *[0.8]*	0.19[(d] *3.3* *[1.5]*	0.23	2.1	33.7[d]	0.13 *1.1*	-0.18 *1.8*	0.02	1.7	1.1

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 heteroscedasiticity 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 4.4
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 4.5
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

	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
5-year nominal (b)	0.52(d) *3.3*	0.12 *0.5*	0.13	1.9	0.1
10-year nominal (b)	-0.36 *1.6*	-0.10 *0.3*	0.03	1.6	0.0
2-year real	0.03 *0.4*	-0.07 *0.6*	0.00	1.9	0.6
5-year real	0.08(c) *2.2*	-0.04 *0.7*	0.05	1.9	0.0
10-year real	0.08(c) *2.6*	0.02 *0.3*	0.08	1.9	0.1
2-year inflation	-0.20 *0.9*	0.57 *1.6*	0.03	1.9	0.3
5-year inflation	0.47(d) *2.8*	0.17 *0.6*	0.11	1.9	0.0
10-year inflation	-0.44 *1.9*	-0.20 *0.5*	0.05	1.5	0.0

Sample 10.90–9.92, N = 24

	β_+	β_-	R^2	DW	H (a)
2-year nominal (b)	-0.80 *1.4* *[1.0]*	0.21 *0.5* *[0.6]*	0.08	1.7	4.5(c)
5-year nominal (b)	-0.26 *0.7*	0.09 *0.4*	0.03	2.1	3.3
10-year nominal (b)	-0.47 *0.9*	0.25 *0.7*	0.04	2.7	0.2
2-year real	0.38 *1.2*	-0.16 *0.7*	0.06	1.5	0.5
5-year real	-0.09 *0.4*	0.04 *0.3*	0.01	1.5	0.5
10-year real	-0.19 *0.7*	0.12 *0.6*	0.03	1.5	0.9
2-year inflation	-1.2 *1.7*	0.37 *0.8*	0.12	1.8	4.1
5-year inflation	-0.17 *0.5*	0.05 *0.2*	0.01	1.5	1.7
10-year inflation	-0.28 *0.5*	0.13 *0.4*	0.01	1.9	0.0

Sample 10.92–4.97, N = 55

	β_+	β_-	R^2	DW	H (a)
2-year nominal (b)	0.09 *0.5*	0.07 *0.6*	0.02	1.8	2.6
5-year nominal (b)	0.25 *1.3*	0.30(d) *2.7*	0.24	2.3	0.1
10-year nominal (b)	-0.14 *0.8* *[0.7]*	0.53(d) *5.1* *[2.9]*	0.36	2.2	20(d)
2-year real	0.06 *0.5*	0.06 *0.8*	0.03	1.9	0.0
5-year real	0.03 *0.4*	0.08 *1.6*	0.08	2.5	0.5
10-year real	-0.000 *0.1*	0.04 *0.9*	0.02	1.9	0.2
2-year inflation	0.02 *0.1*	0.01 *0.0*	0.00	1.9	0.1
5-year inflation	0.22 *1.3*	0.23(c) *2.1*	0.18	2.4	0.1
10-year inflation	-0.13 *0.8* *[0.7]*	0.49(d) *4.7* *[2.5]*	0.33	2.3	38(d)

Sample 4.82–4.97, N = 181

	β_+	β_-	R^2	DW	H (a)
2-year nominal (b)	-0.16 *1.0*	0.26 *1.5*	0.02	1.7	0.3
5-year nominal (b)	0.45(d) *3.9*	0.14 *1.1*	0.11	1.9	0.0
10-year nominal (b)	-0.37(c) *2.3*	0.24 *1.3*	0.03	1.6	0.1
2-year real	0.03 *0.5*	-0.01 *0.2*	0.00	1.9	0.0
5-year real	0.06 *1.8*	0.01 *0.3*	0.02	2.0	0.1
10-year real	0.05 *1.7*	0.02 *0.7*	0.03	2.0	0.0
2-year inflation	-0.17 *1.1*	0.27 *1.4*	0.01	1.9	0.3
5-year inflation	0.42(d) *3.5*	0.13 *0.9*	0.09	2.0	0.0
10-year inflation	-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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