News and the sterling markets

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The Quarterly Bulletin *reports developments in financial markets in detail each quarter in the regular 'Markets and operations' article.*(1) *Day by day, items of news about the economy—in the form of data releases and news about policy—are the most significant market-moving events. This article looks over a longer time period than is usually possible in the 'Markets and operations' article to answer the following two questions:*

- *Which news items tend to move the sterling interest rate markets most?*
- *How do different parts of the sterling yield curve respond to news?*

Introduction

The prices of financial assets adjust continually in response to news. This news can either be 'regular' (ie announcements that are released at pre-determined times known to market participants) or 'irregular' (ie events which are largely, or wholly, unexpected). This article examines how different parts of the sterling yield curve react to different types of regular news. We consider daily interest rate changes for three different assets: the nearest-maturity three-month interest rate futures contract traded on the London International Financial Futures and Options Exchange (LIFFE) (a contract based on three-month sterling Libor), the same LIFFE futures contract for a three-month interbank rate 2½ years ahead, and the yield on the benchmark ten-year gilt.

According to the expectations theory of the term structure, forward interest rates are determined by expectations of the future path of short-term spot interest rates. In other words, longer-maturity interest rates embody expectations of future short rates at all dates up to the maturity of the loan. To the extent that this theory holds, the front (ie nearest-maturity) short sterling futures contract indicates the market's expectation for the level of three-month interest rates at the maturity of the contract. Similarly, the longer-dated futures contract used in our analysis provides information about the market's expectation for the level of three-month interest rates in 2½ years' time. And the yield on the ten-year benchmark gilt should reflect average interest rate expectations over the life of the gilt (ie ten years). Changes in the prices of these three assets indicate how the term structure of sterling interest rates responds to news announcements.

Many other instruments or measures of rate expectations could have been used for this investigation, such as swap rates and forward rate agreements.(2) Also, price changes can be looked at over the whole day of the news announcement or in, say, the first hour immediately following an announcement. This article considers interest rate movements that are large enough, and sustained for long enough, to be observed in day-to-day comparisons.

One extension of the results reported here would be to compare daily movements in the sterling yield curve with intraday responses, which capture the very short-term reaction to a piece of news and allow a richer analysis of trading patterns through the day. Research on this topic is in progress at the Bank of England; initial results suggest that intraday and day-to-day responses are mostly in the same direction, though the size of the responses varies.(3) This is consistent with comments made by market contacts who report that, after the initial market reaction to news, there are often additional changes later in the day (and sometimes the next morning) as traders and analysts process the information contained in the latest news.(4)

Properties of the data

Table A shows the 20 largest daily changes in interest rates at our three chosen horizons between January 1996 and April 1999. There are a number of points to note. First, the largest daily change was a fall of 42 basis points in the

(1) See 'Markets and operations' on pages 327–43.
(2) Swap rates provide an alternative measure to gilt yields of the market's longer-term interest rate expectations, and are attracting increasing market attention in view of the current low level of gilt supply and the impact of the Minimum Funding Requirement (MFR) on gilt market liquidity. On average, however, day-to-day changes in gilt yields due to MFR and supply considerations are small, and are unlikely to have affected the results in this article significantly.
(3) For the exchange rate, intraday and end-of-day responses to news tend to be more diverse, however.
(4) Existing studies have looked at both daily and intraday changes in asset prices. For instance, Almeida, Goodhart and Payne (1998) look at intraday responses; whereas Fleming and Remolona (1999), Haldane and Read (1999), and Joyce and Read (1999) all look at end-of-day responses.

Table A
Top 20 largest daily interest rate movements (basis points)

Front short sterling contract			Short sterling contract 2½ years ahead			Ten-year gilt yield		
Date	Interest rate change	Event	Date	Interest rate change	Event	Date	Yield change	Event
4/6/98	27.0	Interest	26/9/97	-42.0	Other-news (a)	9/10/98	33.1	Other-news
6/6/96	-25.0	Interest	8/3/96	36.0	Interest and US	6/5/97	-28.9	Interest (b)
6/11/97	20.0	Interest	9/10/98	32.0	Other-news	8/3/96	26.9	Interest and US
18/1/96	-19.0	Interest, RS and RPIX	13/3/96	-24.0	LMD	26/9/97	-21.0	Other-news
8/3/96	19.0	Interest and US	16/6/98	24.0	RPIX and US	2/1/97	19.2	Other-news
4/2/99	-19.0	Interest	19/2/96	23.0	Other-news	1/3/96	-18.3	Other-news
30/10/96	18.0	Interest	6/5/97	-23.0	Interest and Independence (b)	1/10/98	-17.0	Other-news
12/1/98	-18.0	IP and PPI	17/6/98	23.0	LMD	19/2/96	16.7	Other-news
3/3/99	17.5	Interest	16/9/97	-22.0	US	16/9/97	-15.7	US
19/3/97	17.0	Minutes, RS, LMD and US	11/3/96	21.0	IP	25/2/99	15.7	Other-news
16/6/98	15.5	Interest, RPIX and US	16/10/96	20.0	LMD and US	5/2/96	15.2	Other-news
3/7/97	15.0	US	20/10/97	19.0	Other-news	5/1/98	-14.3	Other-news
14/1/98	15.0	Minutes and LMD	19/3/97	19.0	Minutes, RS, LMD and US	22/5/97	14.1	RS and GDP
16/10/98	-15.0	US	7/1/99	-17.0	Interest	10/9/98	-14.0	Interest
3/12/98	15.0	Other-news	1/3/96	-17.0	Other-news	16/10/96	13.7	LMD and US
16/1/97	-15.0	Interest and RPIX	1/3/99	17.0	Other-news	30/12/97	13.4	Other-news
18/12/96	14.0	RS and LMD	18/1/96	-17.0	RS and RPIX	16/6/98	13.2	RPIX and US
9/7/98	-14.0	Interest	25/2/99	17.0	Other-news	2/5/96	13.0	Other-news
11/11/98	12.5	LMD and Inflation Report	3/10/97	-16.0	US	7/2/97	-13.0	Other-news
5/3/98	-12.0	Interest	5/1/98	-16.0	Other-news	12/2/99	13.0	Other-news

Legend:

IP	Industrial production data.
Inflation Report	Publication of the Bank of England's *Inflation Report.*
Interest	UK interest rate announcements.
LMD	Labour market data.
Minutes	Publication of the minutes of monetary policy and MPC meetings.
PPI	Producer price index.
RPIX	Retail prices index excluding mortgage interest payments.
RS	Retail sales data.
US	US consumer price index or non-farm payroll data.
Other-news	Days without any of the above data releases or monetary policy announcements.

(a) On this day, there were press reports suggesting that the United Kingdom would enter EMU earlier than had been previously thought.
(b) Interest rates were increased and the Bank of England was granted operational monetary policy independence.

longer-dated short sterling futures contract on 26 September 1997. This change was not related to any of the major data announcements included in our sample, or to a change in domestic monetary policy. Instead, it was caused by reports that the United Kingdom would join EMU earlier than had previously been expected. Second, some pieces of information appear to have had very different effects on interest rate expectations at different maturities. In other words, news may cause the yield curve to pivot, as well as to shift up or down. For instance, the EMU-entry reports on 26 September 1997 had no impact on shorter-term interest rate expectations. And third, domestic data and monetary policy announcements have been more likely to influence shorter-term than longer-term interest rate expectations.

Evidence of this last point can be seen in the fact that 19 of the 20 largest daily interest rate movements in the front short sterling contract were associated with data or monetary policy announcements, compared with only 12 for the longer-dated short sterling contract and 7 for the ten-year gilt. So longer-term interest rate expectations have been influenced by a wider array of information.(1) The largest daily gilt yield change in our sample was also unrelated to a data release or news about a change in the stance of monetary policy. Rather, it was related to sharp de-leveraging by hedge funds in international financial markets.

Many news items affect financial markets each month. In the rest of this article, we confine our analysis to regular items of news (ie released on pre-determined dates known to market participants). We subdivide this news into two groups. The first consists of those monthly macroeconomic data releases that we think are most likely to have moved sterling interest rate expectations over the sample period. These are primarily UK data for: average earnings and employment, GDP, industrial production, producer output prices, retail sales, and the official target measure of inflation—retail prices less mortgage interest payments (RPIX).(2) We also look at the effect of two key US data releases—consumer prices and non-farm payrolls—to test the hypothesis that US developments influence sterling markets significantly. We use the data released at the time of the announcement and make no allowance for subsequent data revisions. The second group consists of monetary policy news in the form of interest rate announcements, publication of the minutes of MPC meetings (and the monthly Chancellor-Governor monetary meetings before that), and publication of the Bank of England's *Inflation Report*.

Table B shows the distribution of daily changes in short-term interest rate expectations implied by the front short sterling futures contract between January 1996 and April 1999.(3) The table shows the distribution of daily changes in rate expectations on:

(i) days when there were no significant regular domestic economic releases ('no-news days');

(1) These findings are consistent with the framework outlined in Haldane and Read (1999).
(2) We also looked at the effect of broad money and the CGNCR/PSNCR, and found that neither had a predictable or significant effect on interest rate expectations.
(3) Futures contracts mature on the third Wednesday of March, June, September and December. Because contracts tend to lose liquidity before they mature, we have chosen to switch contracts at the beginning of the final month of the shortest contract. For example, we take the September contract to be the front contract from June.

(ii) days when significant macroeconomic data were released (see above); and

(iii) days when there was news about monetary policy in the form of interest rate announcements, publication of the minutes of monetary policy meetings, or the release of the *Inflation Report*.

Table B
Percentage distribution of daily changes in interest rates implied by nearest short sterling contract

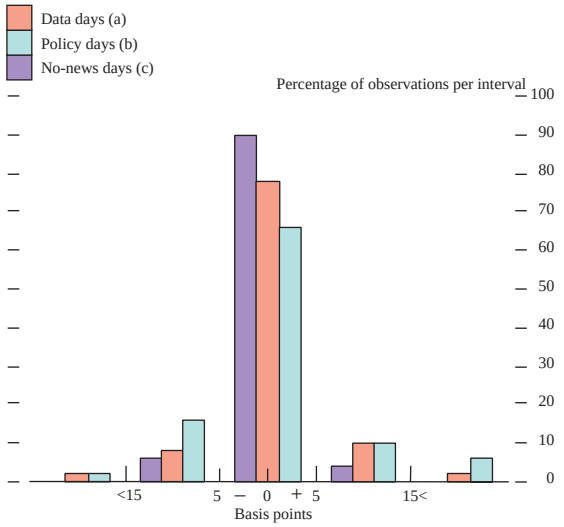
Per cent

	No-news days	Selected data days (a)	Policy days
Rate rose by 15 basis points or more	0.2	1.4	7.8
Rate rose by between 5 and 15 basis points	3.0	8.3	8.9
Rate moved within plus or minus 5 basis points	91.3	82.1	62.2
Rate fell by between 5 and 15 basis points	5.2	7.3	17.8
Rate fell by 15 basis points or more	0.4	0.9	3.3
Number of days in sample	*574*	*218*	*90*

(a) Data releases covered: average earnings and unemployment, GDP, industrial production, PPI, retail sales, and RPIX.

On around 90% of the days when there were no significant data releases or policy announcements, changes in near-term interest rate expectations were confined within a band of +/-5 basis points. This gives us a benchmark against which to judge the impact of news. The second and third columns of the table indicate that rate changes were confined within a band of +/-5 basis points on 82% of the days when selected data were released and on only 62% of days when there was policy news. Chart 1 plots these data in a histogram. The chart shows that daily changes in the interest rate on the front short sterling futures contract tend to be larger on days when there is news about data or policy than on days when there is no such news.

Chart 1
Distribution of daily changes in implied interest rates (nearest short sterling contract)



(a) Data days are when average earnings and unemployment, GDP, industrial production, PPI, retail sales and RPIX data are released.
(b) Policy days are when interest rate announcements occur or when *Inflation Reports* and minutes of MPC/monetary meetings are published.
(c) No-news days are all other days.

Table C and Chart 2 show the distribution of daily changes for the expectation of interest rates in 2½ years' time, as implied by the longer-dated futures contract. Two things are apparent. First, daily changes in interest rates implied by this contract have also tended to be greater on days when there was news about data or policy than on no-news days. And second, daily changes in longer-term interest rate expectations have been more frequently outside the +/-5 basis points margin than for short-term rate expectations (ie the peak of the distribution in Chart 2 is lower than in Chart 1, and the tails of the distribution in Chart 2 are broader). In other words, daily changes in the expectation of interest rates 2½ years ahead were typically larger than changes in short-term expectations, on both news and no-news days (a similar picture emerges from the information provided in Table A).(1)

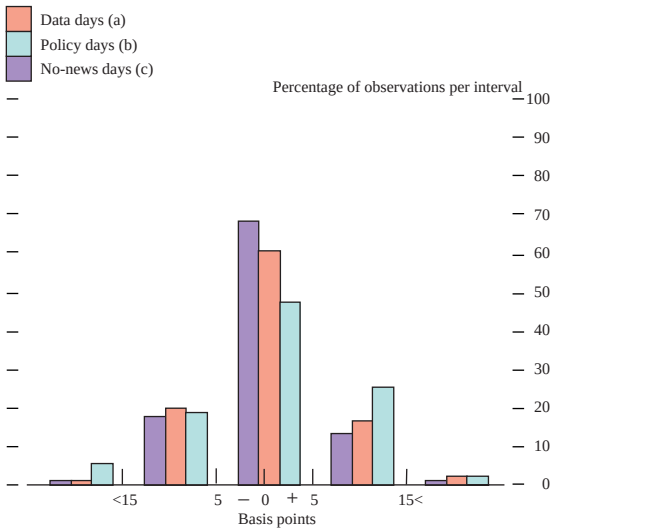
Table C
Percentage distribution of daily changes in interest rates implied by short sterling contract 2½ years ahead

Per cent

	No-news days	Selected data days (a)	Policy days
Rate rose by 15 basis points or more	1.1	2.3	2.2
Rate rose by between 5 and 15 basis points	12.7	17.0	25.6
Rate moved within plus or minus 5 basis points	68.3	60.6	47.8
Rate fell by between 5 and 15 basis points	17.1	19.3	18.9
Rate fell by 15 basis points or more	0.9	0.9	5.6
Number of days in sample	*574*	*218*	*90*

(a) Data releases covered: average earnings and unemployment, GDP, industrial production, PPI, retail sales, and RPIX.

Chart 2
Distribution of daily changes in implied interest rates (short sterling contract 2½ years ahead)



(a) Data days are when average earnings and unemployment, GDP, industrial production, PPI, retail sales and RPIX data are released.
(b) Policy days are when interest rate announcements occur or when *Inflation Reports* and minutes of MPC/monetary meetings are published.
(c) No-news days are all other days.

Two factors help to explain the larger daily changes in the 2½ year ahead interest rate expectation. First, movements in the front contract are constrained by the shorter time to maturity, whereas the longer contract period allows for a

(1) For the no-news days, the standard deviations of the daily interest rate movements in the front and longer-dated short sterling contracts were 3.0 and 5.9 basis points respectively.

larger and more sustained interest rate response to news (there is also likely to be greater uncertainty about the level of rates two to three years ahead). Second, the greater response of longer-maturity contracts could also reflect their lower liquidity. Turnover and open interest (outstanding amounts) in the longer contracts are typically much lower than for short maturities. Lower liquidity can lead to larger jumps in prices on relatively thin volume.

Table D and Chart 3 show the daily distribution of changes in the ten-year gilt yield on news and no-news days. It is harder to discern whether gilt yields tend to change more on days when there is news than when there is no news. This is perhaps not surprising. Given that the ten-year gilt yield measures average interest rate expectations over the next ten years, news about the current state of the economy will be of less relevance than for short sterling. Instead, the key determinants of longer-term interest rates will be inflation expectations and factors that influence the economy's long-run equilibrium real interest rate. (The long rate is also likely to include a varying risk premium.)

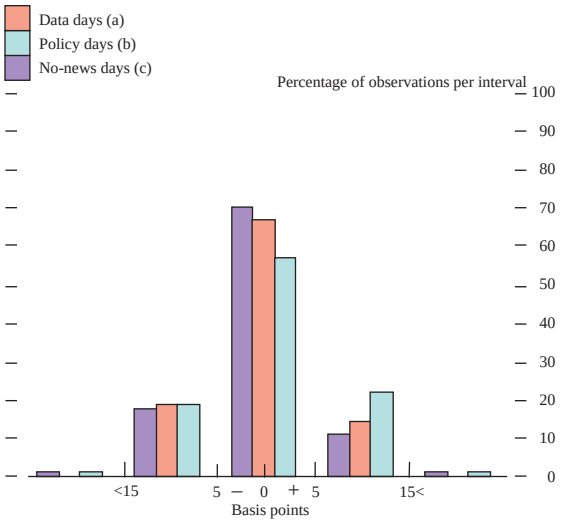
Table D
Percentage distribution of daily changes in ten-year gilt yield

Per cent

	No-news days	Selected data days (a)	Policy days
Yield rose by 15 basis points or more	0.9	0.0	1.1
Yield rose by between 5 and 15 basis points	11.2	14.7	22.2
Yield moved within plus or minus 5 basis points	70.2	66.5	56.7
Yield fell by between 5 and 15 basis points	17.1	18.8	18.9
Yield fell by 15 basis points or more	0.7	0.0	1.1
Number of days in sample	*574*	*218*	*90*

(a) Data releases covered: average earnings and unemployment, GDP, industrial production, PPI, retail sales, and RPIX.

Chart 3
Distribution of daily changes in ten-year gilt yield



(a) Data days are when average earnings and unemployment, GDP, industrial production, PPI, retail sales and RPIX data are released.
(b) Policy days are when interest rate announcements occur or when *Inflation Reports* and minutes of MPC/monetary meetings are published.
(c) No-news days are all other days.

It is possible to test whether the measured sample responses for the no-news, data, and policy days are significantly different from one another using a statistical test (a chi-squared test). The details of this method are described briefly in the Appendix. The technique tests whether the distributions (per interval of interest rate changes) for the data and policy days are the same as the distributions for the no-news days, against the alternative hypothesis that they differ. The results, summarised in Table E, imply that, for the nearest short sterling contract, the probability distributions of interest rate changes for the data and policy days are statistically significantly different from the no-news days. For the longer-dated short sterling contract and the ten-year gilt yield, policy days are statistically distinct from no-news days (at the 1% and 5% significance levels respectively); but data days are not distinct from no-news days for either the longer-dated short sterling contract or the ten-year gilt. These statistics confirm the earlier findings.(1)

Table E
Chi-squared test statistic

	Data days	Policy days
Nearest short sterling contract	14.5 (a)	21.2 (a)
$2^1/_2$ years ahead short sterling contract	6.6	24.7 (a)
Ten-year gilt yield	3.8	11.5 (b)

Note: Test is relative to no-news days.

(a) Significant at 1% level.
(b) Significant at 5% level.

Market surprises

Market participants form expectations about the future, especially news announcements that occur on pre-determined dates. Events that turn out as expected should not, therefore, have any effect on interest rate expectations. So when looking at the effect of news on financial markets, we need to take account of these expectations. To do this, we compare the outturns of our selected data series with survey measures of market participants' forecasts for the respective data. The difference between the two is a measure of the extent to which the data were a surprise, against which the market response can be calibrated. A number of reported surveys of market expectations are collated and published by the electronic news services. These surveys are usually conducted weekly, on a Thursday or Friday, and cover the data releases for the following week. The surveys are sometimes updated if there has been a major surprise that might have led market participants to revise their views of subsequent data releases. In practice, however, it is rare for published expectations to change much during a particular week, even when market participants are re-surveyed.

The various surveys all cover the same, or a largely overlapping set of, investment banks, consultancy firms, and other financial institutions. So the 'median market expectation' from the surveys—generally the most widely quoted measure—is often the same, or very similar, across

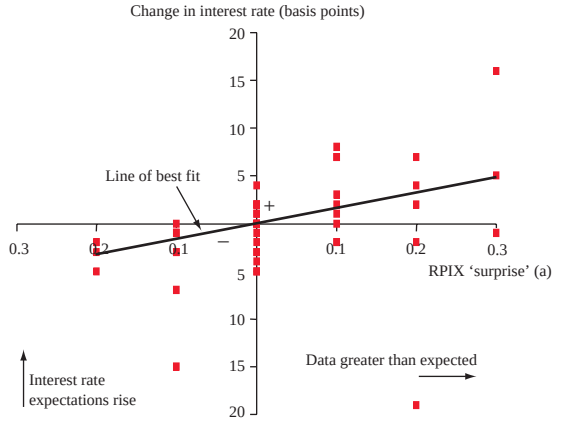
(1) The test statistic could not be applied to the intervals used in Tables B–D and Charts 1–3 because the expected numbers in the outer interval bands were too small to make the test statistically valid. So, for the purpose of the test, we used different intervals (see Appendix for details).

different surveys. For the purpose of this article, we have used the median market expectation published by Bloomberg News.[1]

The markets' response to data surprises

When inflation or activity indicators are higher than expected, interest rate expectations would normally be expected to rise, and *vice versa*. Chart 4 plots the twelve-month change in RPIX minus the market median expectation against the daily change in interest rates implied by the front short sterling contract. Points to the right of the origin show when inflation turned out higher than the market had expected. Points in the top half of the chart indicate that the implied rate on the short sterling contract rose on the day of the inflation announcement. Most observations lie in the southwest and northeast quadrants of the chart, as expected; the positive slope of the line of best fit confirms the view that, over the sample period, interest rate expectations have tended to rise when inflation outturns exceeded expectations. Throughout the rest of this article, data surprises are measured in the same way: 'positive surprises' indicate that data turned out to be higher than expected.

Chart 4
Effect of RPIX surprises on interest rate expectations: nearest short sterling contract



(a) Measured as actual minus expected; units are percentage points.

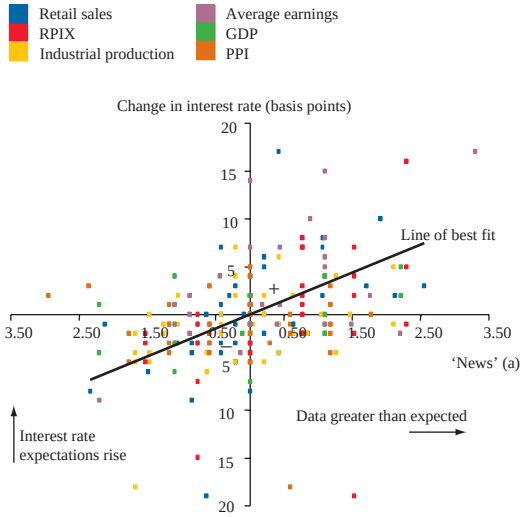
Chart 4 does not, however, allow comparison of different data releases on a like-for-like basis. A forecast error of, say, 0.2 percentage points would be more significant when forecasting twelve-month RPIX inflation than a similar-size error when forecasting a more volatile series such as monthly changes in industrial production.[2] To illustrate, Table F shows the standard deviation of past forecast errors for the data series considered in this article. We have therefore divided each forecast error by the standard deviation of past forecast errors. Surprises are then measured in units of standard deviation, making different data surprises comparable. Charts 5, 6 and 7 show how our three interest rate measures have reacted to all the domestic

Table F
Standard deviation of past surprises[a] in forecasting data releases (1996–99)

Industrial production (monthly change)	0.48
Retail sales (monthly change)	0.48
Average earnings (twelve-month rate)	0.23
PPI (twelve-month rate)	0.17
RPIX (twelve-month rate)	0.13
GDP (quarterly change)	0.09

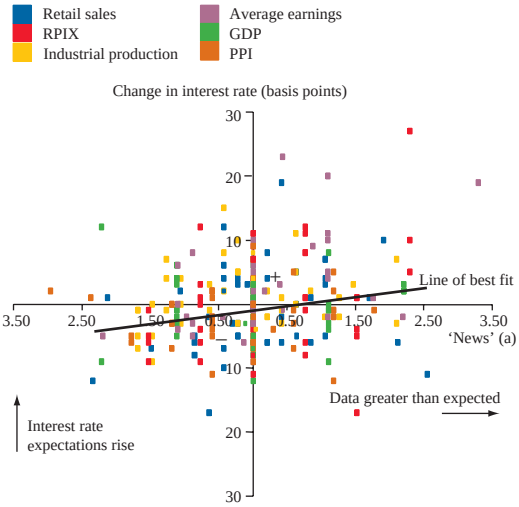
(a) Surprise measured as actual outturn minus expectations.

Chart 5
Effect of data surprises on interest rate expectations: nearest short sterling contract



(a) Actual minus expectation, divided by standard deviation of past forecast errors.

Chart 6
Effect of data surprises on interest rate expectations: short sterling contract 2½ years ahead

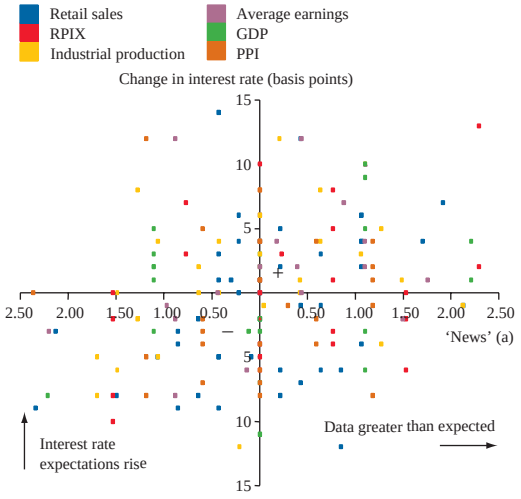


(a) Actual minus expectation, divided by standard deviation of past forecast errors.

data releases since January 1996 (compared on the same basis). Short-term interest rate expectations (as measured by the front short sterling futures contract) show the strongest positive relationship: interest rates tend to rise when data outturns are stronger than expected and fall when

(1) Joyce and Read (1999) used market expectations measured by Money Market Services (MMS). They found these expectations to be unbiased, ie the forecast errors have a mean not significantly different from zero. They also found no serial correlation in the forecast errors.
(2) For each of the data items considered in this article, forecasts of monthly, quarterly or annual changes could be used. In each case, our choice was determined by which series the market typically focuses most attention on.

Chart 7
Effect of data surprises on ten-year gilt yields



(a) Actual minus expectation, divided by standard deviation of past forecast errors.

data turn out weaker than forecast. Although the relationship is also positive for the longer-dated futures contract, the strength of the relationship (indicated by how closely the data points cluster around the line of best fit) is weaker.(1) Furthermore, no clear relationship is evident between the data surprises and the observed movements in ten-year average interest rate expectations (as measured by the benchmark gilt).

Which data items move the sterling yield curve most?

Tables G, H, and I report results from a series of simple regressions based on the following equation:

$$\Delta i^e = \alpha + \beta S \qquad \textbf{(1)}$$

where:

Δi^e is the change in interest rate expectations, as measured by interest rate movements for each of our three horizons, between close of business on the day before a data announcement and close of business on the day of the announcement;

α is a constant;

β is the slope coefficient; and

S is our measure of the data surprise (data outturn less market expectation, divided by standard deviation of past forecast errors).

We can use the regression results to test a number of hypotheses. First, events that were expected should, on average, have no impact on interest rate expectations (or, put another way, market participants' expectations should be unbiased). This implies that in all of the equations, α should be equal to zero. Second, as noted earlier, stronger-than-expected inflation and activity indicators should cause market participants to revise their interest rate expectations upwards. This implies that the β coefficients should be positive and significantly different from zero. And third, short-term interest rate expectations should be more responsive to indicators of current economic conditions, while gilt yield movements should be more responsive to factors that influence long-term inflation expectations and the economy's equilibrium real rate of interest. By comparing the sizes of the different β values we also obtain some indication of which data surprises moved interest rate expectations most over our sample period: the larger the value of β, the more interest rate expectations are revised for any given surprise.

The results provide some evidence to support all three hypotheses. First, in nearly all of the regressions, the constant term, α, is insignificantly different from zero. Second, in every case where the surprise variables are found to have a significant effect on interest rate expectations, the

Table G
Regression results—nearest short sterling futures contract

	Slope coefficient, β	Significance level of: β	Constant, α
Average earnings	0.030	1%	5%
Retail sales	0.027	1%	n.s.
RPIX	0.020	1%	n.s.
US CPI	0.019	1%	n.s.
Industrial production	0.017	1%	n.s.
US NFP	0.015	5%	n.s.
GDP	0.009	5%	n.s.
Unemployment	0.004	n.s.	n.s.
PPI	-0.002	n.s.	n.s.

Note: n.s. = not significant.

Table H
Regression results—short sterling futures contract 2½ years ahead

	Slope coefficient, β	Significance level of: β	Constant, α
Average earnings	0.037	1%	n.s.
US NFP	0.030	5%	n.s.
RPIX	0.025	5%	n.s.
US CPI	0.025	5%	5%
Retail sales	0.013	n.s.	n.s.
Industrial production	0.005	n.s.	n.s.
PPI	0.003	n.s.	n.s.
GDP	-0.002	n.s.	n.s.
Unemployment	-0.005	n.s.	n.s.

Note: n.s. = not significant.

Table I
Regression results—ten-year benchmark gilt yield

	Slope coefficient, β	Significance level of: β	Constant, α
US NFP	0.029	5%	n.s.
US CPI	0.021	5%	n.s.
Retail sales	0.020	5%	n.s.
RPIX	0.013	n.s.	n.s.
Average earnings	0.012	n.s.	n.s.
Industrial production	0.008	n.s.	n.s.
PPI	0.002	n.s.	n.s.
GDP	0.001	n.s.	n.s.
Unemployment	-0.010	n.s.	n.s.

Note: n.s. = not significant.

(1) The lines of best fit shown in Charts 5, 6, and 7 are all derived using the simple least squares regression technique outlined below.

sign of the slope coefficient, β, is appropriate (ie positive). And third, the front short sterling contract responds to a wider array of data surprises than either of the two other interest rate instruments. There is also evidence that the two US data releases included here (consumer prices and non-farm payrolls) have a greater influence on longer-term sterling interest rate expectations than most domestic data. The large size of the US economy means that it is likely to be a significant influence on world interest rates. So the UK markets' reaction to US data surprises is compatible with the view that domestic market participants may believe that US activity and inflation developments are key determinants of world inflationary pressures and hence world (and UK) long-run interest rates.

A comparison of the slope coefficients in Tables G, H, and I also gives some indication of which data have tended to move sterling interest rate expectations most. Both the short sterling contracts seem to be most responsive to average earnings and inflation data (for the United Kingdom and the United States). Retail sales data have also had a strong effect on interest rate expectations, although this relationship was not found to be statistically significant for the longer-dated short sterling contract. GDP and industrial production releases have had a smaller impact on short-term interest rate expectations, and unemployment and producer price data were not found to be significant influences at all.(1)

To summarise, our findings for the period January 1996 to April 1999 are:

(i) Near-term interest rate expectations responded predictably to a wide array of activity and inflation surprises.

(ii) Surprises in average earnings and RPIX inflation affected short-term interest rate expectations most.

(iii) Interest rate expectations two to three years ahead were more volatile than three-month expectations, and reacted to a smaller set of data surprises.

(iv) Ten-year interest rate expectations were less responsive to surprises about current domestic economic conditions, but reacted to two US indicators.

Conclusions

The very short end of the sterling yield curve—as measured by the nearest short sterling contract—tends to change more on data and policy news days than on days when there is no significant news. That is also true, though to a lesser extent, for the short sterling contract two to three years ahead. Movements at the longer end of the yield curve—measured here by the change in the ten-year gilt yield—tend to be less closely tied to domestic news. Among individual domestic data releases, average earnings, RPIX and retail sales are the most significant market-moving events. Two key US data releases, consumer prices and non-farm payrolls, significantly affected the longer end of the UK yield curve.

(1) Unemployment data are released as part of a package with average earnings (and employment) data. The empirical results suggested that the average earnings data had a significant effect on the yield curve, but that the unemployment data did not.

Appendix: Chi-squared test for differences in probabilities

The aim of the chi-squared test statistic is to quantify whether the probability distribution of changes in interest rates is statistically significantly different on policy days and data days from the distribution on no-news days. In the case of data days, this is done by testing the null hypothesis that the distributions of rate changes (for suitably chosen intervals) are the same for data days and no-news days, against the alternative hypothesis that the distributions are not the same. The chi-squared test is based on a contingency table of size 2 times c, where c is the number of intervals chosen (see the contingency table for an example where $c = 3$).

Contingency table

	Interval 1	Interval 2	Interval 3	Totals
No-news days	O_{11}	O_{12}	O_{13}	$n_1 = O_{11} + O_{12} + O_{13}$
Data days	O_{21}	O_{22}	O_{23}	$n_2 = O_{21} + O_{22} + O_{23}$
Totals	$C_1 = O_{11} + O_{21}$	$C_2 = O_{12} + O_{22}$	$C_3 = O_{13} + O_{23}$	$N = n_1 + n_2$

The test statistic is defined as:

$$T = \sum_{i=1}^{2} \sum_{j=1}^{c} \left(O_{ij} - E_{ij} \right)^2 / E_{ij} \qquad \textbf{(1)}$$

Here O_{1j} are the observed numbers of rate changes in interval j for no-news days ($i = 1$), and O_{2j} are the observed numbers of rate changes in interval j for data days ($i = 2$). The expected number of rate changes for each interval j, if the null hypothesis is true, is given by:

$$E_{ij} = n_i \, C_j / (n_1 + n_2) \qquad \textbf{(2)}$$

with n_i being the number of observations in sample i, and with C_j defined as in the example in the table.

If the null hypothesis is true, and if the sample size is large enough, the test statistic is distributed as a chi-squared random variable with $(c - 1)$ degrees of freedom. The null hypothesis that all probabilities are the same on no-news days and data days is rejected at significance level s if the test statistic T is larger than a critical value, namely the $(1 - s)$ quantile of the chi-squared distribution with $(c - 1)$ degrees of freedom.

The test requires that the expected values for each interval E_{ij} are not too small. As a general guide, the size of each interval should be sufficiently large to ensure that there are at least five expected values within each interval.[1] So it would be inappropriate to calculate the test statistic using the intervals shown in Charts 1 to 3, since the expected numbers in the outer intervals would be too small to draw reliable inferences. To address this problem, we chose interval sizes such that the expected number of observations in each interval was greater than ten. Reflecting this, our intervals (in basis points) for the front short sterling futures contract were: $x \leq -3$; $-3 < x \leq -1$; $-1 < x < 1$; $1 \leq x < 3$; and $x \geq 3$. For the longer-dated futures contract and the ten-year gilt yield, the five intervals were: $x < -4.5$; $-4.5 \leq x < -1.5$; $-1.5 \leq x \leq 1.5$; $1.5 < x \leq 4.5$; and $x > 4.5$.

(1) See Cochran (1952).

Data sources

Data releases: We use data released at the time of the announcement and do not, therefore, make an allowance for subsequent revisions to data (since the market response on the day will be to the published data).

Front short sterling futures contract: The underlying data are from prices traded on the London International Financial Futures and Options Exchange (LIFFE); we took data from Bloomberg. Contracts mature on the third Wednesday of March, June, September and December. Because contracts tend to lose liquidity before they mature, we switched contracts at the beginning of the final month. For example, we take the September contract to be the front contract from June.

Longer-maturity short sterling futures contract: This is the LIFFE contract that matures 2½ years hence; data taken from Bloomberg.

Median market expectation: Taken from Bloomberg's survey of market expectations.

Ten-year gilt yield: We used the generic ten-year bond yield quoted by Bloomberg. Bloomberg defines this as the bond that the market judges to be the current ten-year benchmark. Over our sample period, the benchmark ten-year bond changed five times.

Sample period: January 1996–April 1999 (except for Charts 4–7 which include data to September 1999).

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