Markets and operations

This article reviews developments since the Summer Quarterly Bulletin *in sterling and global financial markets, in market structure and in the Bank's official operations.*(1)

- *International short-term nominal forward interest rates fell, as market participants appeared to revise downwards their views on the likely future path of monetary policy. Nominal forward rates at longer maturities also fell.*
- *Equity markets were little changed and, except in Japan, remained close to the levels prevailing at the start of 2004. Credit spreads narrowed, particularly on high-yield and emerging market bonds.*
- *Measures of implied and realised volatility have generally been low across financial markets.*
- *The Bank announced on 22 July the main results of its review of its operations in the sterling money markets.*

As had been widely anticipated, official interest rates in both the United Kingdom and the United States were raised over the period, each by 50 basis points in two 25 basis point moves. But market participants' views on the likely *future* path of monetary policy were revised downwards, with international short-term nominal forward rates falling by between 9 and 24 basis points (Table A).

This revision to market expectations about future interest rates followed higher oil prices and mixed US data releases (particularly weak labour market statistics for June and July), prompting some commentators to question the strength of the US recovery. Economists' forecasts for US GDP growth in 2004 were revised downwards in July and August, having ticked up slightly in June (Chart 1). Conversely, forecasts for 2004 GDP growth for the euro area and the United Kingdom rose

Table A
Summary of changes in market prices

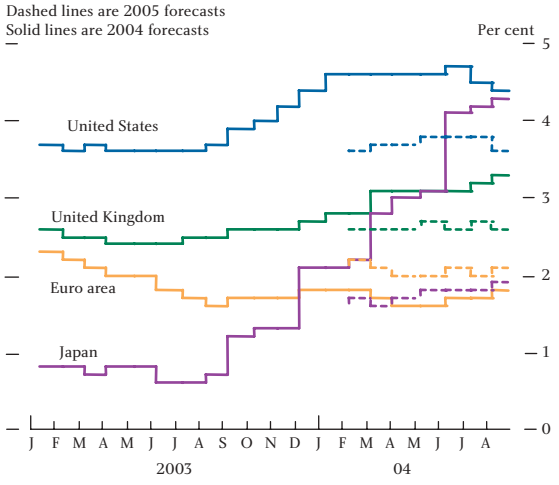
	28 May	3 Sept.	*Change*
December 2004 three-month interbank interest rate (per cent)			
United Kingdom	5.34	5.10	*-24 bp*
Euro area	2.37	2.28	*-9 bp*
United States	2.42	2.32	*-10 bp*
Ten-year nominal forward rate (per cent) (a)			
United Kingdom	4.95	4.84	*-10 bp*
Euro area	5.47	5.18	*-28 bp*
United States	6.72	6.37	*-35 bp*
Equity indices (domestic currency)			
FTSE 100 index	4431	4551	*2.7%*
Euro Stoxx 50 index	2737	2739	*0.1%*
S&P 500 index	1121	1114	*-0.6%*
Exchange rates			
Sterling effective exchange rate	105.8	103.4	*-2.3%*
$/€ exchange rate	1.22	1.21	*-0.8%*

Columns may not correspond exactly due to rounding.

Sources: Bank of England and Bloomberg.

(a) Three-month forward rates, derived from the Bank's government liability curves. Estimates of the UK curve are published daily on the Bank of England's web site at www.bankofengland.co.uk/statistics/yieldcurve/main.htm.

Chart 1
Expected real GDP growth



Source: Consensus Economics.

(1) The period under review is 28 May (the data cut-off for the previous *Quarterly Bulletin*) to 3 September.

slightly, and there was a more significant upward revision to the 2004 GDP growth forecast for Japan.

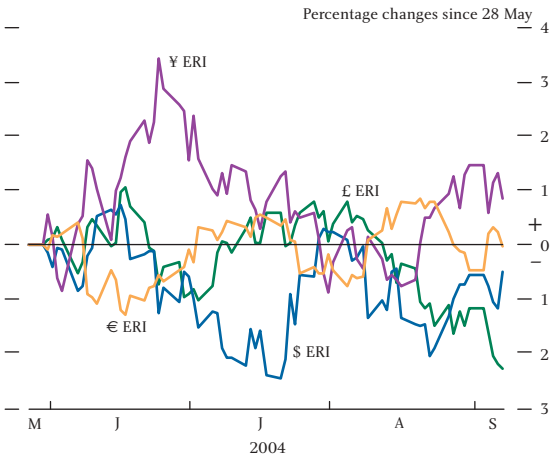
While the mixed news about the outlook for the global recovery had an impact on near-term interest rate expectations, there was no apparent increase in market measures of uncertainty over the future course of monetary policy. In fact, implied volatility derived from options prices generally fell across interest rate, foreign exchange and equity markets.

Low levels of volatility may have made it more difficult for speculative accounts, such as hedge funds, to generate high returns. There has also been a further narrowing of credit spreads as well as a flattening of the US yield curve, with the latter reducing the pay-off to investors of the so-called 'carry trade' (funding short to invest long). At the same time, there have been some early signs that rises in official rates may be relieving the pressure on institutions to find absolute returns.

Foreign exchange and short-term interest rates

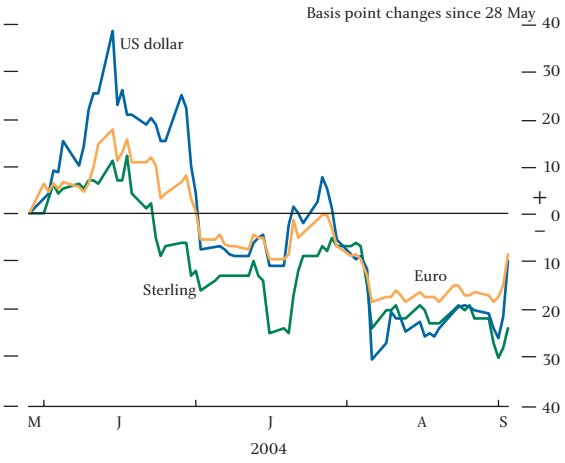
Movements in the foreign exchange market largely reflected the mixed pattern of economic news (Chart 2). Consistent with increased optimism about the outlook for the Japanese economy, there was a marked appreciation of the yen exchange rate index (ERI) during June, although much of this subsequently reversed, in part following higher oil prices, as Japan has a relatively high dependence on oil imports. The dollar ERI, meanwhile, fell during late June and early July, but subsequently rose to end the period little changed. Over the period as a whole, the largest change was for the sterling ERI, which fell during August, having moved within a narrow range during June and July.

Chart 2
Cumulative changes in exchange rate indices



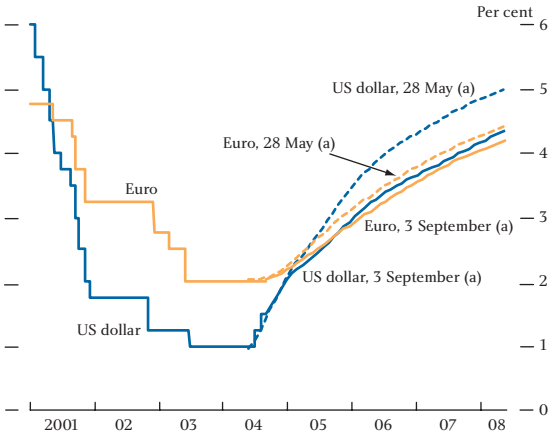
Short-term nominal forward interest rates fell across all currencies, as market participants appeared to scale back their expectations of near-term rises in official rates (Charts 3 and 4). This downward revision was particularly marked for short-term US dollar forward rates following the weak US data releases. Having risen by nearly 40 basis points in early June, dollar forward rates implied at the end of 2004 ended the period around 10 basis points lower. Euro rates fell by a similar amount and, by 3 September, market prices suggested that neither US dollar nor euro rates were expected to rise above 4% until around end-2007 (Chart 4).

Chart 3
Cumulative changes in three-month interest rates implied by December 2004 futures contracts



Sources: Bloomberg and LIFFE.

Chart 4
International official and forward market interest rates



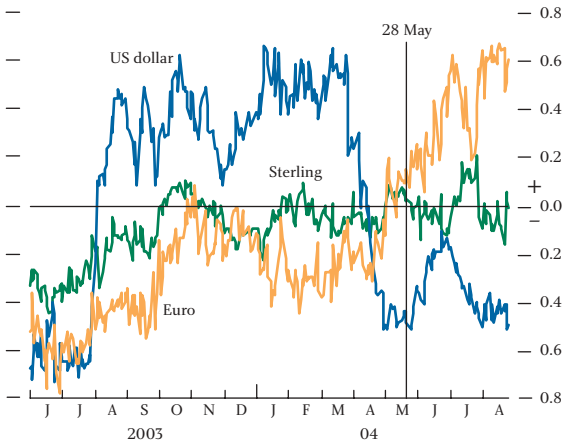
(a) Two-week nominal forward rates implied by repo rates and prices of government securities.

For sterling rates, at least part of the fall in short-term nominal forward rates appeared to be led by UK-specific developments; for example, the market's interpretation of the statement accompanying the Monetary Policy Committee's (MPC's) decision to raise official interest

rates in August. But the comovement between international interest rates, highlighted in the Summer *Quarterly Bulletin*, remained high over the period, with euro and sterling markets also reacting to key US data releases, such as the employment reports.

In contrast, the perceived balance of near-term risks around the level of short-term interest rates varied across currencies, according to a measure of skew derived from short-term interest rate options (Chart 5). For dollar rates, risks to the market's central expectation remained skewed to the downside, despite the fall in the level of nominal forward rates. Conversely, for euro rates, the skew became more positive over the period, suggesting that, as market participants shifted down their central expectation, they perceived a risk that rates could rise sooner than expected. The perceived risks around the level of sterling interest rates, meanwhile, remained broadly balanced.

Chart 5
Six-month implied skew from interest rate options

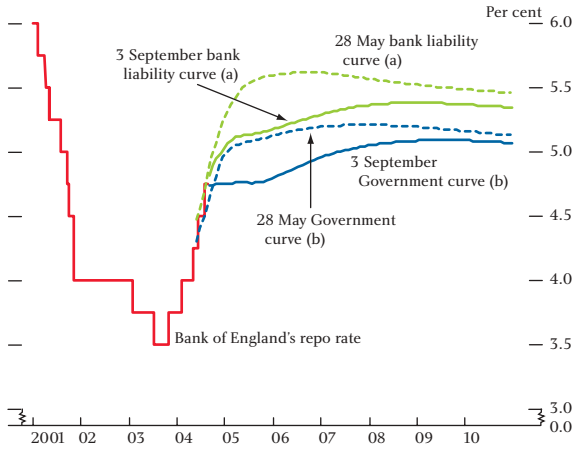


Sources: Bank of England, CME and LIFFE.

In the United Kingdom, the MPC raised its repo rate by 25 basis points at two of its three meetings held during the period, on 10 June and 5 August. Given differences in the stance of monetary policy across the various currency areas, the sterling forward curve was flatter than both the dollar and euro curves on 3 September, but at a lower level than at the beginning of the review period, reflecting the general downward revision of policy expectations (Chart 6).

On 3 September, the profile of short-term forward sterling rates out to 2010 implied by gilt prices and

Chart 6
Sterling official and forward market interest rates

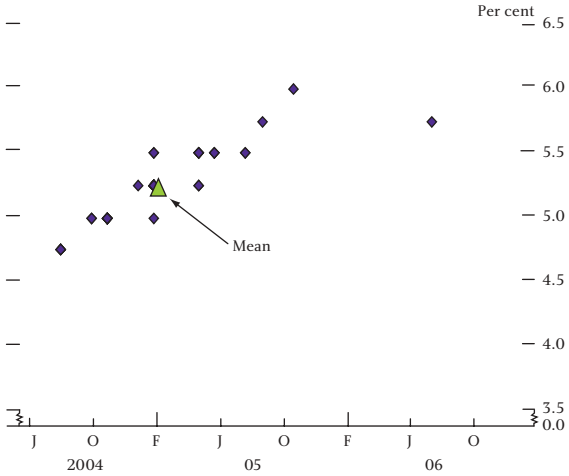


(a) Two-week nominal forward rates implied by a curve fitted to a combination of instruments that settle on Libor.
(b) Two-week nominal forward rates implied by GC repo/gilt curve.

GC gilt repo rates lay in a range of around 35 basis points. By way of comparison, the profile of forward rates implied by instruments that settle on Libor rates lay in a wider range of around 55 basis points. While neither of these measures is perfect as an indicator of market expectations of future official rates,(1) taken together they suggest that the market anticipated only moderate further increases in sterling rates—two further 25 basis point interest rate rises at most—and that the central expectation was for fairly stable rates beyond mid-2005.

A similar view was reflected in survey-based measures of interest rate expectations. The latest Reuters poll of

Chart 7
Reuters poll of timing and level of next peak in UK official interest rates(a)



Sources: Bank calculations and Reuters.

(a) Survey conducted 31 August to 2 September.

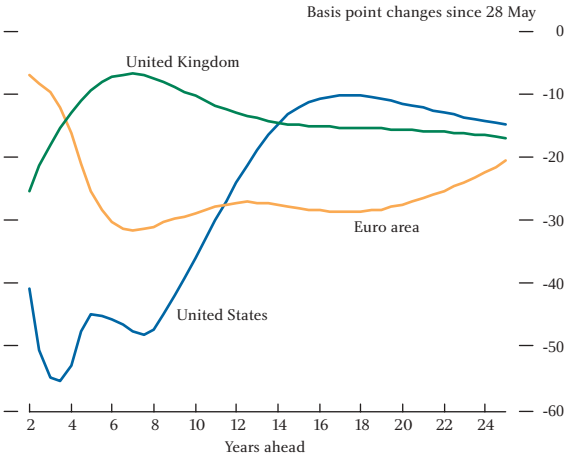
(1) Forward rates implied by both sets of instruments will differ from expected future official interest rates because of risk premia. Of the two, the gilt curve will be closer, as the other curve is fitted to instruments that settle on Libor, which embodies a credit premium for banking sector risk. On the other hand, short sterling futures are less likely to be affected by technical factors that may distort the gilt curve from time to time.

economists for their views on the timing and level of the next peak in UK official interest rates was conducted from 31 August to 2 September (Chart 7). The mean result put the peak at 5.24% (nearly 50 basis points above the repo rate prevailing on 3 September) in February 2005.

Longer-term interest rates

Looking further along the curve, longer-term forward rates also fell across all three currencies (Chart 8).

Chart 8
Changes in implied nominal forward rates(a)

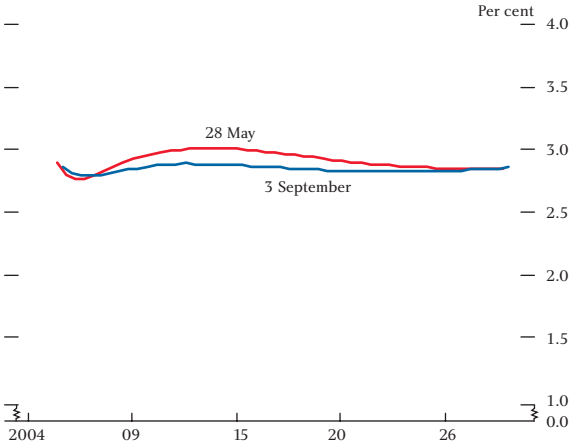


(a) Instantaneous forward rates derived from the Bank's government liability curves.

Sterling forward rates fell by around 7 to 15 basis points at medium to long horizons. According to a forward-looking measure of RPI inflation, derived from the difference between yields on nominal and index-linked gilts, much of the fall can be attributed to a downward revision to market expectations about future inflation and/or inflation risk premia. Over the period, the forward inflation curve flattened, with the entire curve now within a 10 basis point range (Chart 9).

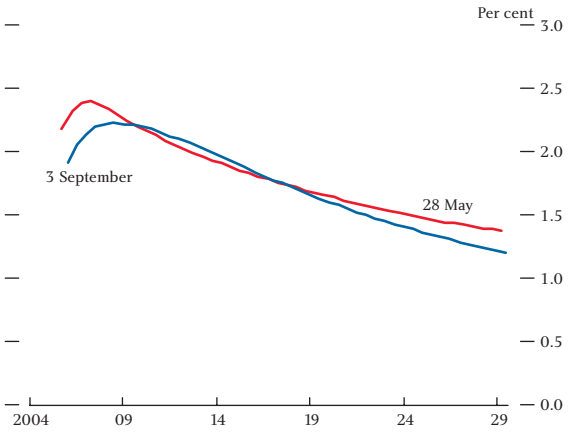
At shorter horizons, and at the very long end of the curve, falls in sterling nominal forward rates were accompanied by falls in sterling real rates (as implied by index-linked gilts) (Chart 10). The level of sterling real forward rates at very long maturities fell further below the range that most economic commentators would regard as plausible in terms of economic fundamentals alone. As mentioned in previous *Quarterly Bulletins*, these low levels are likely to reflect high demand for

Chart 9
Sterling forward break-even RPI inflation curve



Source: Bank of England.

Chart 10
Sterling real forward rates



Source: Bank of England.

index-linked gilts by institutional investors, in particular pension funds. By their nature, pension funds have long-duration liabilities and these often offer protection against inflation. These liabilities need to be matched by long-duration, inflation-protected assets, such as index-linked gilts. Given the relatively low yields on these gilts, contacts report that funds may increasingly turn to other instruments to protect the value of their assets against inflation, such as inflation swaps, particularly those indexed to the limited price index (LPI).(1)(2)

Using information from the growing inflation swaps market, a similar decomposition into their real and inflation components can be obtained for euro nominal forward rates. Chart 11 shows that euro inflation

(1) The LPI is a price index used by pension funds. It rises with the retail prices index, but with a floor of 0% and currently a cap of 5%.
(2) For further details on inflation swaps, see the box entitled 'Inflation-protected bonds and swaps' (2004), *Bank of England Quarterly Bulletin*, Summer, pages 124–25.

forward rates were changed little over the period as a whole, whereas euro real forward rates fell. This may conceivably reflect the concerns over the strength of the recovery, or simply rising demand for inflation protection in the euro area.

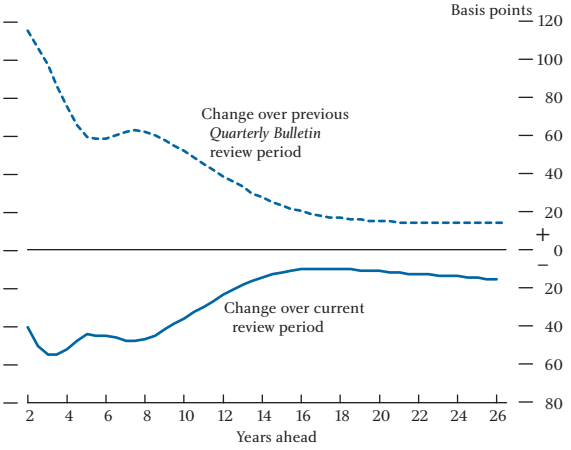
Chart 11
Implied euro real and inflation forward rates(a)

Sources: Bank of England and Bloomberg.

(a) Euro real rates subtract inflation swap rates from nominal government yields, which are not directly comparable due to credit risk.

In the US dollar market, the fall in longer-term nominal forward rates over the period reversed much of the rise reported in the Summer *Quarterly Bulletin* (Chart 12). As noted then, such marked movements in response to individual data releases, particularly at the longer end of the curve, are relatively unusual. Nevertheless, mixed news about the US economy and its impact on market perceptions about the global recovery do appear to have been the main drivers behind these movements.

Chart 12
Changes in US dollar forward rates(a)

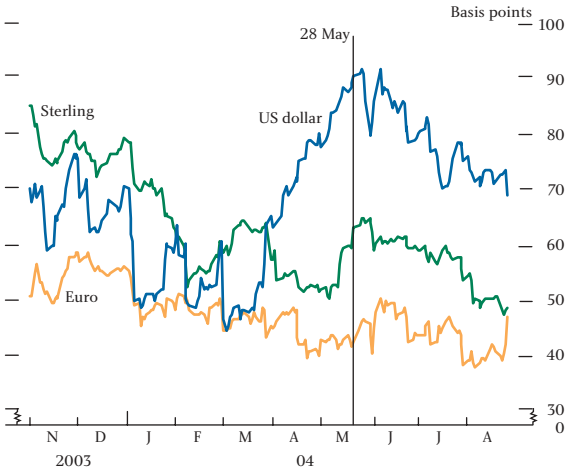


(a) Instantaneous forward rates derived from the Bank's government liability curve.

Developments in market volatility

Other things being equal, mixed news about the strength of the global recovery might have been expected to lead to higher levels of near-term uncertainty around the future path of monetary policy. But measures of short-term interest rate uncertainty, derived from options prices, fell or were little changed (Chart 13). One likely explanation is that the rises in official interest rates that occurred over the period, particularly in the United States, had the effect of resolving some of the uncertainty evident earlier in the year over the upward path of US official rates from the low starting level. Indeed, dollar interest rate uncertainty fell most.

Chart 13
Six-month implied volatility from interest rate options



Source: Bank of England.

More difficult to explain are measures of uncertainty at longer maturities derived from swaptions prices. Given the marked fluctuations in longer-term dollar forward interest rates observed over the past six months, short-term uncertainty over, say, five-year rates, might have been expected to increase. Similarly, given that official dollar interest rates have remained relatively low over the period, and the expected pace of tightening has been revised downwards, uncertainty over dollar interest rates at longer horizons (ie for longer-expiry options) might have been expected to pick up. According to swaptions data, however, uncertainty over five-year swap rates viewed over both the near term and longer horizons actually fell over the period (Chart 14). Moreover, both measures were at low levels in early September compared with recent experience.

One explanation for this is that the swaptions market may be affected by flows related to the hedging of

mortgage-backed securities (MBS).[1] Contacts report that MBS-related hedging has remained relatively light, despite the recent falls in longer-term dollar yields, which may account for the generally low level of swaption volatility, at least relative to the same period last year. Nevertheless, such distortions aside, it is somewhat puzzling that interest rate volatility around medium-term maturity rates has not increased significantly in light of the marked reaction of long-horizon forward rates to US data releases.

Chart 14
Implied volatility from US dollar swaptions

Source: JPMorgan Chase and Co.

The generally low level of implied volatility across asset classes has prompted some commentators to suggest that it has been unusually low, given both geopolitical risks and the mixed signals on the global economic outlook. Other commentators have maintained that the low levels of implied volatility are consistent with recent experience: realised volatility has also been low and, with the exception of the sterling and dollar short-term interest rate markets, the relationship between the two has not appeared unusual in an historical context (Table B).

Table B
Implied and realised volatility

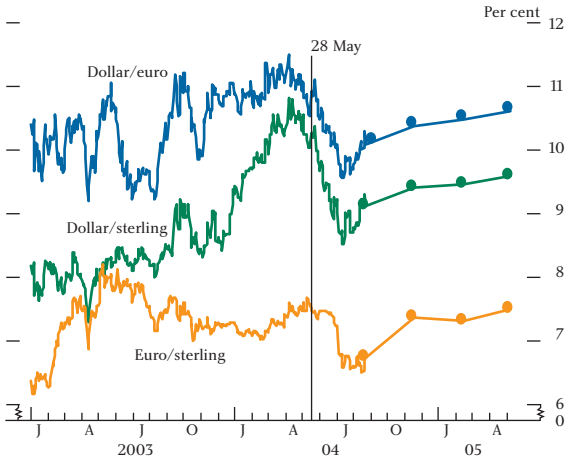
	Three-month volatility on 3 September		Longer-term averages of three-month volatility (a)	
	Implied	Realised	Implied	Realised
Short-term interest rates (basis points)				
United Kingdom	36.1	42.8	59.8	63.2
Euro area	33.5	25.9	49.8	46.4
United States	45.6	61.7	55.5	58.6
Equities (per cent)				
FTSE 100	11.6	10.5	22.1	19.2
Euro Stoxx 50	15.5	13.2	25.9	24.5
S&P 500	13.7	10.9	21.3	19.2
Foreign exchange (per cent)				
$/£	9.4	8.1	8.6	7.5
€/£	7.0	6.4	8.1	7.4
$/€	10.4	9.3	11.0	10.0

Sources: Bank calculations, Bloomberg and UBS.

(a) Average values since 1998, except euro exchange rates, which are average values since 1999.

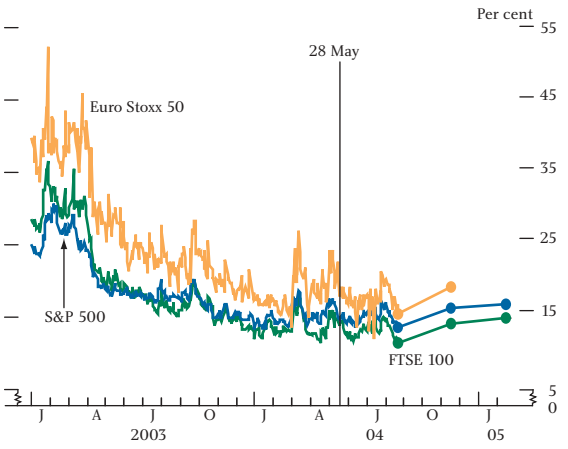
In foreign exchange markets, implied volatility has fallen over the period for all the major cross rates (Chart 15), whereas in equity markets implied volatility changed little, but remained at historically low levels (Chart 16).

Chart 15
Three-month implied foreign exchange volatilities(a)



(a) The solid lines show three-month implied volatility in per cent. The dots indicate the three-month implied volatility three, six, nine and twelve months ahead respectively.

Chart 16
Three-month implied volatilities of selected equity indices(a)



(a) The solid lines show three-month implied volatility in per cent. The dots indicate the three-month implied volatility three, six and (where possible) nine months ahead respectively.

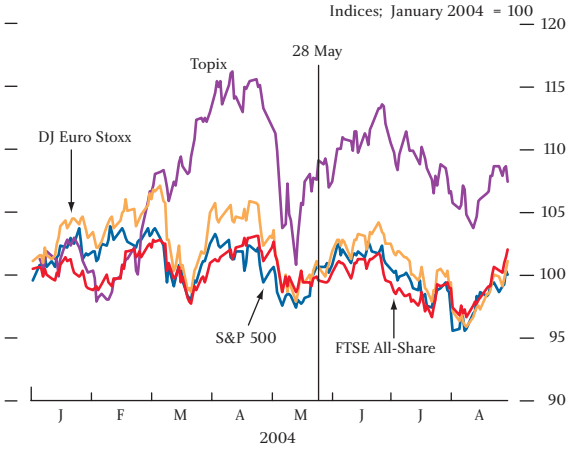
Equity and credit markets

With short-term measures of uncertainty in equity markets largely unchanged, equity price movements over the period may have been influenced more by changes in earnings growth expectations and/or real interest rates. Consistent with a fall in sterling real interest rates, which would tend to lead to higher equity prices via lower discount rates, the FTSE All-Share increased over

(1) See 'Markets and operations' (2003), *Bank of England Quarterly Bulletin*, Autumn, pages 258–59.

the period. But despite some falls in international real interest rates, other major equity indices were little changed or slightly lower over the period (Chart 17). With the exception of the Topix, the major equity indices have changed little over the course of 2004, perhaps suggesting that investors will increasingly focus on strategies that do not rely on equity strength to generate returns. This so-called 'search for alpha' is described in the box on pages 272–73.

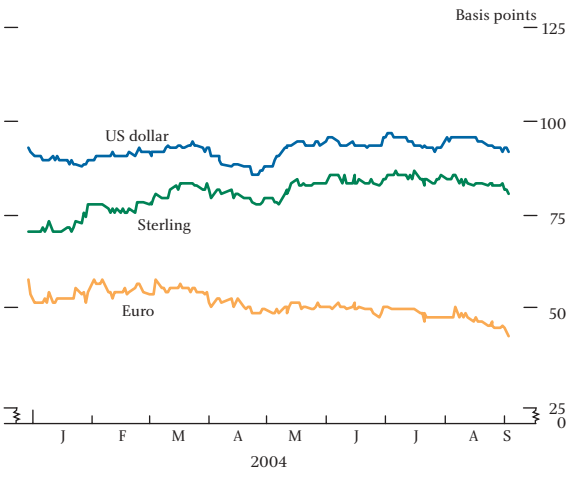
Chart 17
Selected equity indices (local currency)



Source: Thomson Financial Datastream.

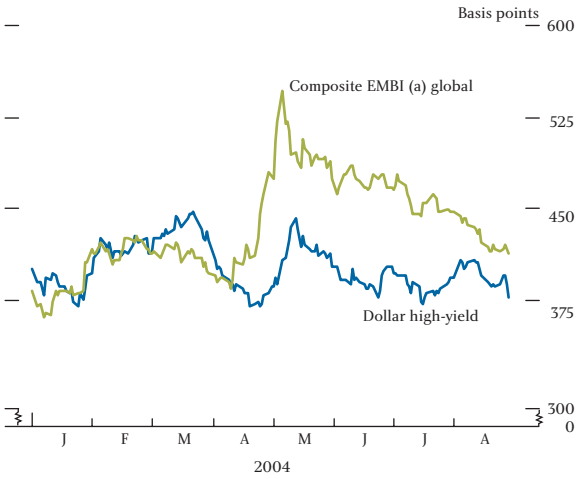
Credit spreads on investment-grade bonds narrowed very slightly (Chart 18). And there was a more significant narrowing in credit spreads on high-yield and emerging market bonds, reversing some of the sharp widening observed earlier in the year (Chart 19). This suggests that, while there may have been some slowing in the expected pace of recovery, the market perceived little sign of a more significant prospective downturn that might be accompanied by corporate credit losses.

Chart 18
International investment-grade option-adjusted bond spreads



Source: Merrill Lynch.

Chart 19
Emerging market and high-yield bond spreads

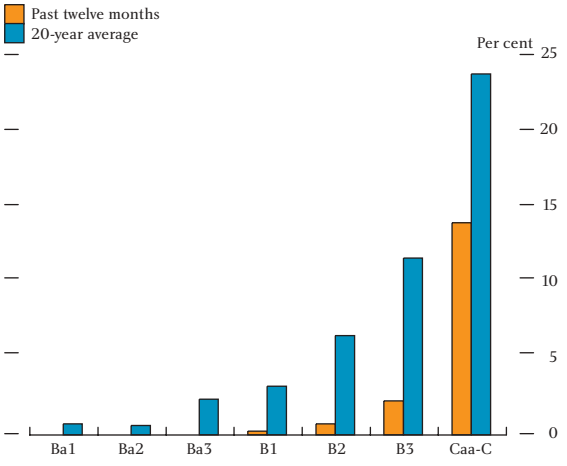


Sources: JPMorgan Chase and Co. and Merrill Lynch.

(a) Emerging Markets Bond Index.

Narrower spreads might have reflected a combination of continuing high levels of investor demand for high-yield bonds, and a benign outlook for credit markets. Evidence for the latter is provided by ratings agencies' forecasts for default rates, which remained low, consistent with recent outturns; globally, Moody's annual default rate on high-yield bonds fell to 2.9% in July. And while a substantial proportion of the very lowest-rated bonds have defaulted, default rates for most high-yield bonds were well below past averages (Chart 20).

Chart 20
Annual default rates by credit rating (all currencies)



Source: Moody's.

Given an apparently favourable outlook and high investor demand, high-yield issuance appears to have picked up again, following a decline in 2004 Q2. But risks to investors remained. Through 2004, the level of issuance rated B- or below, in both the United States and the euro area, has been high relative to its historical average and some ratings agencies have noted

Search for alpha

Innovations in portfolio management and asset allocation are increasingly being referred to by the asset management industry in terms of a 'search for alpha' or 'portable-alpha strategies'. Broadly, 'alpha' describes returns on an asset that are predictable but do not rely on any exposure (or 'beta') to the market portfolio, usually defined in terms of a major equity index. Unsurprisingly, the recent focus on alpha follows a period of weak equity market returns (since 2000), with many asset managers expecting future returns to be somewhat lower than the high levels experienced in the late 1980s and 1990s.(1)

In formal terms, alpha is best explained in terms of the capital asset pricing model (CAPM).(2) Letting $E(.)$ denote expectations of the return on the security, r_i, and on the market portfolio, r_m, and r_f the relevant risk-free interest rate:

$$E(r_i) - r_f = \alpha + \beta\left[E(r_m) - r_f\right]$$

In this model, beta (β) determines the size of the market risk premium—the expected excess return (over the risk-free rate of interest) on a security that compensates the investor for the asset's non-diversifiable exposure to the market portfolio. Alpha (α) can then be identified as the expected excess return on the asset over and above the market risk premium.

If securities are efficiently priced by the market in the CAPM model, $\alpha = 0$; investors are compensated only for an asset's non-diversifiable exposure to the market portfolio. In this context, therefore, a non-zero value for alpha is a pricing error and can be identified only with respect to the expectations of an individual or set of individuals, rather than to the expectations of the market as a whole.

Practitioners in the fund management industry translate these concepts to refer to two types of return: that generated from market exposure, beta, and that from security selection, alpha. They also refer, in turn, to two sources of beta: 'passive' beta returns from exposure to the market; and 'active' beta returns from skill in market timing—increasing market exposure in rising markets, and decreasing it in falling markets. Alpha returns derive from (skill in) security selection within an asset class, and do not depend on the direction of the overall market.(3)

The so-called 'portable alpha' strategies advocated by a number of fund managers and investment consultants entail seeking to enhance returns from one asset class by adding alpha return from another asset class. For example, the market in smaller-capitalisation equities is sometimes suggested as one potential source of excess return, on the grounds that it might be less efficient than the market for large-capitalisation stocks.

As an example, suppose that a pension fund has allocated 40% of its portfolio to S&P 500 equities, and wishes to outperform the index without significantly changing its underlying exposure. It might seek to achieve this by selling a portion of its S&P 500 portfolio, and investing the proceeds in a combination of a long position in S&P 500 index futures (to maintain its beta exposure relative to the S&P 500), and an investment in a small-cap stocks fund to generate alpha. It might offset its small-cap beta exposure by selling Russell 2000 index futures. By this means, it would hope to enhance its return on S&P 500 equities by substituting for the alpha on that portion of S&P 500 stocks sold with what it believes will be a potentially higher alpha on the small-cap equities it has bought with the proceeds. Alternatives for obtaining such small-cap alpha exposure might include investing in a long/short small-cap equity hedge fund.

Beyond this, some asset managers and consultants are advising more fundamental changes in underlying portfolios—also typically described as portable alpha strategies but involving a more eclectic asset mix. This might involve a number of long-duration fixed income investments (such as conventional bonds, asset-backed bonds etc) intended to provide a hedge for part of a pension fund's quasi fixed-income liabilities, together with suggested potential sources

(1) A part may also have been played by many corporate defined benefit pension funds aiming to improve their asset/liability management, for example, by seeking returns that are less volatile, and less correlated with the market portfolio.
(2) See, for example, Copeland, T E and Weston, J F (1992), *Financial theory and corporate policy*.
(3) An active manager following a pure alpha strategy would maintain a beta of 1.0 relative to the benchmark, and all of the active management return would derive from skill in individual security selection.

of alpha such as small and mid-cap equities, international equities, emerging market economy assets, private equity, and investments in absolute-return funds (essentially hedge funds).

There are, inevitably, questions as to the sustainability of the expected investment outperformance—that is, of the so-called alpha. First, to the extent that it has been possible consistently to generate alpha, that may partly reflect the relative inefficiency of a variety of markets that are small and illiquid in comparison with, say, the capitalisation of US S&P 500 stocks. Large-scale asset allocations to these sectors might increase efficiency and, over time, erode any alpha available.

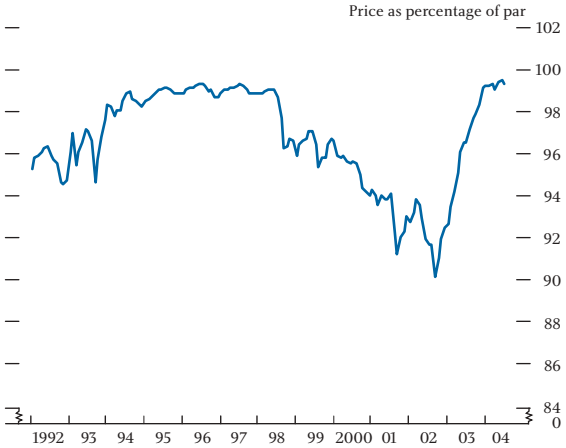
Second, some such investment strategies may not inherently deliver supernormal returns; rather, a more diversified approach may generate returns that are less correlated with US large-capitalisation equities. Greater diversification may, in other words, improve correlation with a wider definition of the 'market' that approximates more closely to an investor's true benchmark.

Third, it cannot be ruled out that these proposed and actual asset reallocations embody a degree of exuberance, with part of the motivation deriving from particular asset classes having generated high total returns in the period leading up to the reallocation. If so, it is possible that this, in turn, has perhaps reflected relatively large amounts of money already having been committed to what are relatively small asset classes in a 'search for yield'. If so, there may be scope for these asset prices to adjust, or for their growth rates to moderate from those seen over the past year or so. In that case, investment funds engaged in a search for alpha may find themselves disappointed. The Bank will continue to monitor these developments as part of efforts to understand the investment management industry.

that, in the past, such a high concentration of sub investment-grade issuance at very low ratings has been followed by increased default rates in subsequent years.

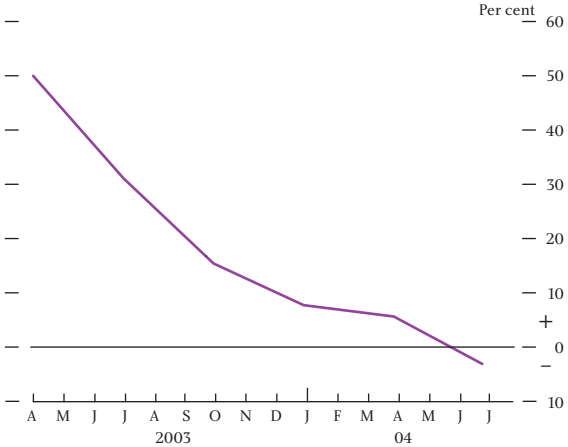
Continuing strong demand for high-yield assets has also been reflected in a further tightening of US leveraged loan spreads; on average, loans are now almost trading at par (Chart 21). And competition to lend among banks has reportedly been high, allowing some borrowers to loosen, or even to remove, covenants. Respondents to the ECB euro-area bank lending survey reported more easing than tightening of covenants during 2004 Q2, the first time a net easing has been reported since the survey began in January 2003 (Chart 22).(1)

Chart 21
US leveraged loans index



Sources: Bloomberg and Credit Suisse.

Chart 22
Net percentage of European banks reporting a tightening of covenants



Source: ECB's bank lending survey.

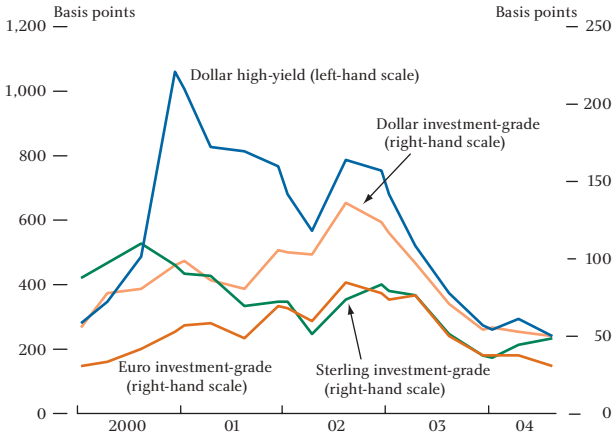
(1) This is consistent with market anecdote reported in the section entitled 'Risks in the international financial system' (2004), *Bank of England Financial Stability Review*, June, pages 50–51.

Search for yield

The narrowing of leveraged loan and high-yield credit spreads, together with developments in interest rate markets, little change in equities and generally low levels of market volatility, may have made the task of generating higher returns more challenging.

For example, the narrowing in high-yield spreads has also been accompanied by a narrowing of the distribution of spreads within each rating group, particularly for high-yield credits (Chart 23). The interquartile range of spreads on a large number of high-yield US dollar corporate bonds fell in 2004 Q2, and remained at a historically low level. This may indicate a lack of investor discrimination, and also suggests less opportunity to increase yield by taking firm-specific credit risk.

Chart 23
Interquartile range of corporate spreads by rating

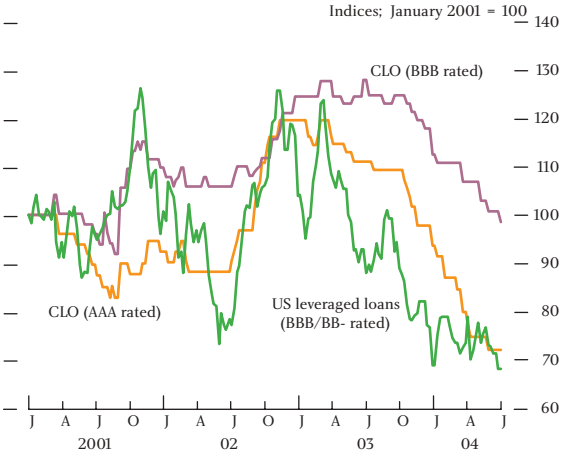


Sources: Merrill Lynch and Bank of England calculations.

Market contacts further reported that, should the downward trend in leveraged loan spreads be sustained, the recent high growth in repackaging these loans as collateralised loan obligations (CLOs) may slow. This is because, as the spreads on the underlying collateral (ie the leveraged loans) tighten, it becomes increasingly difficult to structure a CLO that provides potential investors with a sufficient increase in yield over the underlying collateral. Indeed, spreads on leveraged loan CLOs have tightened notably through 2004, broadly following the tightening in spreads on the leveraged loans themselves, but with a lag (Chart 24).

Perhaps reflecting this fall in spreads on CLOs and other established collateralised debt obligations (CDOs), dealers have increasingly looked to alternative types of collateral to structure CDOs. In particular, market

Chart 24
Collateralised loan obligation (CLO) and US leveraged loan spreads



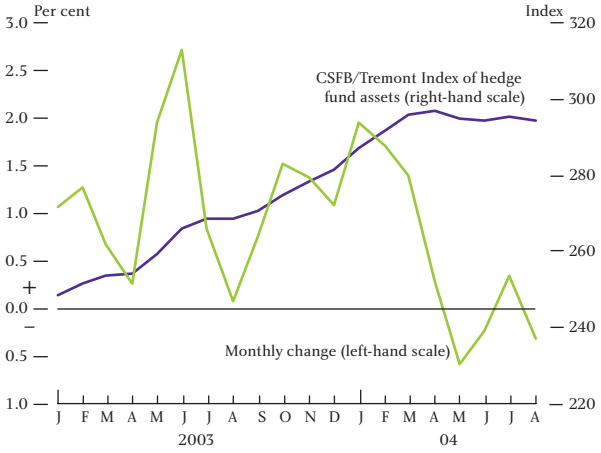
Sources: JP Morgan Chase and Co. and S&P/LCD.

contacts have reported significant growth in issuance of so-called 'CDO-squared' products. The collateral underlying a CDO-squared is typically a selection of mezzanine tranches from a pool of standard CDOs.

An alternative strategy for finding yield that has been widely reported over the past year or so has been to exploit the generally low level of official interest rates using a yield curve 'carry trade' (borrowing at the short end to fund investment at a longer maturity). At least, in principle, yield curve carry trades should benefit from the low level of dollar interest rate volatility noted earlier, since—if it is expected to persist—the likelihood of movements in bond prices leading to capital losses and hence eroding the interest rate 'carry' would be reduced. Nevertheless, data on speculative positions and anecdotal evidence from market contacts suggest that there has been some unwinding of these trades. In part, this is likely to have reflected the flattening of the dollar yield curve over the review period.

On balance, therefore, designing strategies to find yield may have become more challenging. Against this backdrop, some speculative players, such as hedge funds, may have struggled to make positive returns. Although it is difficult to gauge the state of the hedge fund industry, available data suggest that hedge funds have not sustained the strong asset growth experienced in 2003. Indeed, there is some evidence to suggest that asset values have fallen over the period (Chart 25). Contacts also report that some hedge funds may have been enhancing returns by writing more options, ie selling volatility, thereby earning the premium income.

Chart 25
Hedge fund performance



Sources: Bloomberg and CSFB/Tremont.

Looking forward, a rising interest rate environment might be expected to relieve the pressure on institutions to find absolute returns. Indeed, there are some early signs of a change in investor behaviour. For example, issuance of structured notes designed to enhance yield through exposure to interest rate risk fell significantly through 2004 Q2. Any future developments will be reported in future editions of the *Quarterly Bulletin* as well as the *Bank of England's Financial Stability Review*.

Developments in market structure

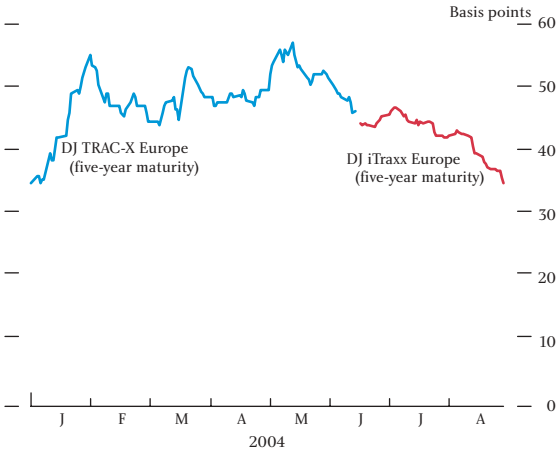
This section provides an update on some structural developments in credit markets, examines the potential market impact of new rules on capital requirements for UK insurance companies, and notes a recent development in the electronic trading of euro-denominated government bonds.

Credit indices

On 21 June, two widely used families of tradable European credit default swap (CDS) indices (DJ TRAC-X and iBoxx) merged into a single product, known as DJ iTraxx Europe. This was followed on 26 July by the launch of a new suite of Asian CDS indices—DJ iTraxx Asia—which were also based on existing indices.(1)

The indices are designed to represent the average credit premia on a pool of liquid CDSs. In terms of composition, there is a considerable degree of overlap between the new and old European benchmark indices, which is reflected in a similar level of premia between the indices (Chart 26). And in line with the old products, the new suite of iTraxx credit indices includes an array of tradable subindices, listed in Table C. In addition to sectoral subindices, there is a European 'HiVol' index, which contains the 30 credits from the benchmark index with the highest CDS spreads, and a 'Crossover' index, which contains 30 lower-rated credits.

Chart 26
European credit default swap index spreads(a)



Source: JPMorgan Chase and Co.

(a) Spreads are for the 'on-the-run' index, ie they refer to the most recently issued basket of underlying credits.

Table C
Overview of DJ iTraxx CDS indices

Index name (number of credits at launch)

Europe
DJ iTraxx Europe (125)
- Senior Financials (25)
- Subordinated Financials (25) (a)
- Non-financials (100)
  - Energy (20)
  - Industrial (20)
  - TMT (20)
  - Consumer cyclical (15)
  - Consumer non-cyclical (15)
  - Autos and auto parts (10)

DJ iTraxx Europe HiVol (30)
DJ iTraxx Europe Crossover (30)
DJ iTraxx Europe Corporate (52) (b)

Asia
DJ iTraxx Asia excluding Japan (30)
- DJ iTraxx Korea (8)
- DJ iTraxx Greater China (9)
- DJ iTraxx Rest of Asia (13)

DJ iTraxx Australia (25)
DJ iTraxx CJ (50)

Source: International Index Company.

(a) Same names as Senior Financial.
(b) Selection of non-financials from DJ iBoxx Corporate Bond Index.

One aim of the merger, which was largely welcomed by market participants, was to consolidate liquidity by creating a single benchmark. Early evidence suggests that there has already been some improvement in the liquidity of the European indices. In July, bid/ask spreads on the DJ iTraxx European benchmark index averaged around half a basis point. Prior to the merger,

(1) These mergers followed similar developments in CDS indices in other markets earlier in the year. More specifically, it was announced in April that the North American and emerging market CDS indices produced by TRAC-X and iBoxx would merge, to form a single suite of indices known as DJ CDX.

the average bid/ask spread on the (discontinued) TRAC-X Europe index was around 1 basis point.

Increased standardisation and liquidity should improve the attractiveness of credit indices for potential investors. For investment purposes, CDS indices are a convenient tool for taking 'directional' views on general credit conditions, since they provide easy access to a diversified credit portfolio at a lower cost than would be incurred by constructing a basket of single-name CDSs.

It is also possible to trade standardised 'tranches' of the benchmark DJ iTraxx Europe index. Analogous to the tranches of a collateralised debt obligation (CDO), these tranches realise losses depending on their level of subordination and the co-dependence of default in the underlying credits. Investors can speculate on this co-dependence by trading in the relevant standardised tranches. They can also be used as a hedging tool. For example, dealers structuring bespoke single-tranche CDOs will be exposed to some risk of changes in co-dependence of default, which they may be able to hedge using the standardised CDS index tranches.(1) The effectiveness of such a hedge, however, would depend on the degree of overlap in the pool of credits underlying the bespoke CDO and the pool underlying the CDS index.

Capital requirements for UK insurance companies

On 2 July, the United Kingdom's Financial Services Authority (FSA) published revised rules on capital requirements for UK life and non-life insurers. Some economic commentators suggested that, as institutions re-optimise portfolios to meet new regulatory requirements, the proposals could have triggered large reallocations across asset classes, perhaps influencing market prices. Anecdotal evidence from Bank contacts, however, suggests that the new rules have not had any significant market impact.

The new rules followed a period of industry consultation, most recently in the form of Consultation Paper (CP) 195 and CP190, which addressed capital requirements and balance sheet provisions for, respectively, life insurers and non-life insurers.(2) The published rules, Policy Statement (PS) 04/16, confirmed that many of the proposals discussed during the consultation period would be adopted, and formalised a regime intended to relate the capital buffer held by insurance companies more closely to the riskiness of their assets and liabilities. The rules are due to be incorporated in the FSA's Integrated Prudential Sourcebook, and will take effect on 31 December 2004.

One important aspect of the new regime is the so-called 'twin peaks' approach to setting capital requirements for with-profits life firms. This requires these firms to calculate capital levels under two sets of assumptions, the so-called 'regulatory peak' and 'realistic peak'. The minimum regulatory capital requirement (or capital resource requirement) is determined by whichever 'peak' is higher. The 'regulatory peak' is designed to represent 'a prudent actuarial assessment' of the reserves required to meet contractual obligations (for example, preannounced bonuses). The 'realistic peak' represents an assessment of the reserves required to cover 'expected' liabilities (including future and terminal bonuses) plus a risk capital margin (RCM).

The RCM is designed to provide a cushion against possible losses arising from unusual market price movements or economic conditions—in effect, a stress test. Broadly, it stipulates a test covering five classes of risk: credit, equity, interest rate, real estate and persistency (to cover policy termination risk). For any given asset, the RCM outlined in the new proposals generally implies a slightly lower capital requirement than under the CP195 proposals.

There have also been some changes to the calibration of the credit test. More specifically, under CP195, the risk weightings assigned to each asset were determined by the asset's credit rating. As a consequence, the CP195 proposals, if implemented, could have created an incentive for insurers to invest in the cheapest (and therefore the riskiest) assets for any given rating, in order to maximise the return to regulatory capital.

In an attempt to eliminate the incentive to hold the riskiest asset for any given credit rating, PS04/16 links the RCM credit stress test to each individual asset's credit spread. A potential implication of this change is that insurers may have the incentive to switch into shorter-maturity and/or higher-rated assets. This is because credit spreads—especially on assets with a relatively low credit rating (BBB-rated assets, for example)—tend to be higher the longer the maturity of

(1) For more details on single-tranche CDOs, see the box entitled 'Developments in portfolio credit risk transfer markets' (2003), *Bank of England Financial Stability Review*, December, pages 27–28.
(2) For more information about CP195, see *Bank of England Financial Stability Review*, December 2003, pages 83–84.

the asset. In practice, however, Bank contacts reported little anecdotal evidence of large sales of long-maturity BBB-rated assets.

In any case, the potential for any such sales (were they to materialise) to have a significant influence on market prices should, in an efficient market, be limited. This is because other investors might be expected to take advantage of any significant sales, meaning the price impact would be transitory. Indeed, many contacts believe that increased demand from pension funds may at least partially offset any fall in insurers' demand for corporate bonds.

Another change from CP195 is that the new rules exempt certain AAA-rated supranational bonds from the RCM tests (in common with highly rated sovereign debt). Also, the new rules require the credit test to be applied to derivatives, which will ensure that credit risks held 'synthetically' through derivatives positions will also be subject to capital requirements.

Bank contacts have reported that, relative to CP195, the revised tests are generally expected to have a lower distortionary impact, in terms of giving insurers incentives to behave in a suboptimal way. That said, several market participants have commented that some aspects of the new regime require further clarification: it is not obvious, for example, exactly how credit tests will be applied to counterparty credit risk on interest rate swaps and other derivatives.

Contacts have further noted that PS04/16 may result in increased use of collateral in interest rate swaps (via a credit support annex (CSA)), should insurers seek to reduce capital charges arising from counterparty credit exposure. Wider use of CSAs, which would reduce counterparty exposure between financial institutions, would be welcome from a financial stability standpoint.

EuroMTS

In recent years, trading via electronic platforms has become increasingly widespread, and is now available across a range of asset classes. For more mature markets, these platforms have enabled dealers to cut the costs of wholesale trading, while often increasing price transparency. In the euro area, the main platform for trading those euro-denominated government bonds with amounts outstanding greater than €5 billion is EuroMTS. This is essentially a group of domestic markets, each separately governed, but trading across a common platform. Trading is anonymous, with participants notified of counterparties only after execution of the trade. A key element of EuroMTS is that participants have market-making obligations, ie they must display tradable prices for a certain number of hours each day.

On 2 August, Citigroup transacted a large deal predominantly via MTS platforms, selling around 200 euro-denominated bonds in less than two minutes, estimated to have been around €11 billion in value. Despite the large volumes, there was no disruption to the system, and dealers obliged to quote a price on the system found themselves holding these bonds, seeking to hedge their positions in bond futures markets. With many other dealers in a similar position, hedging at prevailing bond prices became difficult. As a result, Citigroup was able to buy back bonds at a much reduced price only half an hour later.

Shortly afterwards, a number of dealers withdrew their quotes from the system; and press reports suggested that some dealers would withdraw from the electronic platforms permanently if another such instance arose. This would obviously have implications for the liquidity that the system is able to provide. On 4 August, MTS announced a temporary regulation that imposed an automatic minimum two-month suspension if any participant executed trades within a two-minute period across the main EuroMTS platform and offshoots in Ireland, Austria and Greece, the total volume of which breached some maximum limit. This restriction, however, has since been lifted.

This episode marks a new stage in the evolution of inter-dealer trading among wholesale market participants, and so for the infrastructure underpinning liquidity in some asset markets.

Bank of England official operations

Changes in the Bank of England balance sheet

There was an increase in both the sterling and foreign-currency components of the Bank's balance sheet over the period (Table D). The Bank maintained the value of its three-month and six-month euro-denominated bills outstanding at €3.6 billion by rolling over bills at maturity. Average three-month issuance spreads improved slightly to 8.7 basis points below Euribor, compared with 8.2 basis points in the previous period (March-May); average six-month bills

Table D
Simplified version of Bank of England consolidated(a) balance sheet(b)

£ billions

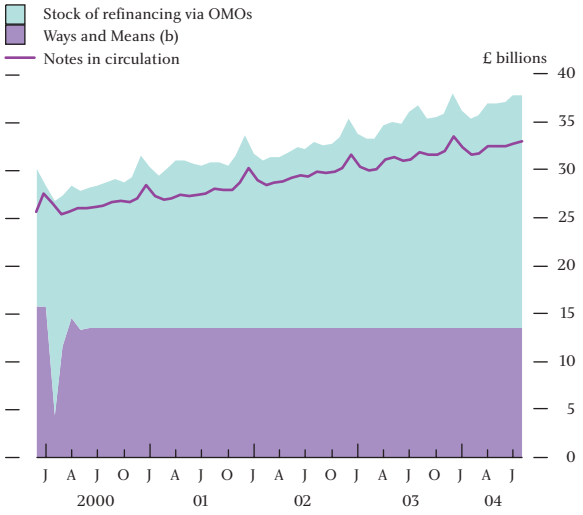
Liabilities	3 Sept.	28 May	Assets	3 Sept.	28 May
Bank note issue	39	38	Stock of refinancing	27	26
Settlement bank balances	<0.1	<0.1	Ways and Means advance	13	13
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	8	7	Other sterling-denominated assets	4	4
Foreign currency denominated liabilities	11	10	Foreign currency denominated assets	14	12
Total (c)	**58**	**55**	**Total** (c)	**58**	**55**

(a) For accounting purposes the Bank of England's balance sheet is divided into two accounting entities: Issue Department and Banking Department. See 'Components of the Bank of England's balance sheet' (2003), *Bank of England Quarterly Bulletin*, Spring, page 18.
(b) Based on published weekly Bank Returns. The Bank also uses currency, foreign exchange and interest rate swaps to hedge and manage currency and non-sterling interest rate exposures—see the Bank's 2003 *Annual Report*, pages 53 and 73–79 for a description.
(c) Figures may not sum to totals due to rounding.

spreads were 10.3 basis points below Euribor, compared with 10.5 basis points previously.

Notes in circulation, by far the largest sterling liability on the Bank's balance sheet, increased over the period, with peaks due to seasonal demand over the late-May and August Bank Holidays and more gradual month-on-month increases due to trend growth in demand for notes (Chart 27).

Chart 27
Bank notes in circulation, the stock of OMO refinancing, and 'Ways and Means'(a)

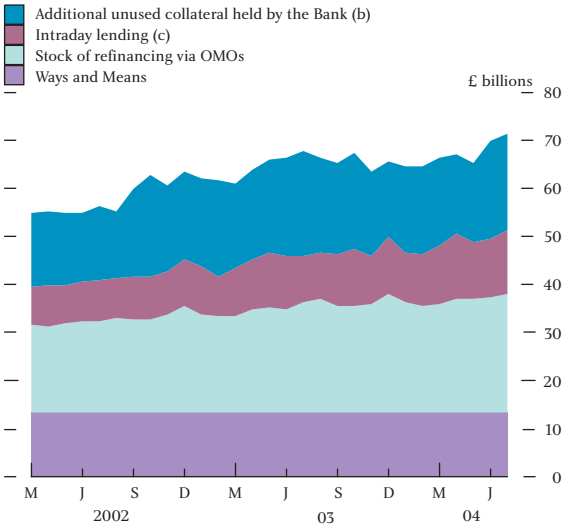


(a) Monthly averages.
(b) An illiquid advance to HM Government. This fluctuated prior to the transfer of responsibility for UK central government cash management to the UK Debt Management Office in April 2000. The Ways and Means is now usually constant, varying only very occasionally.

That part of the stock of refinancing provided by short-term open market operations (OMOs) moved broadly in line with the level of notes in circulation (Chart 27). Other sterling-denominated assets, including the Bank's sterling bond portfolio, were broadly unchanged. The box on page 279 describes recent technical changes to the Bank's management of this portfolio.

During the day, the Bank's balance sheet is considerably larger, reflecting for the most part lending to settlement banks (via reverse repo of high quality securities) to enable them to make payments in the Bank's RTGS payments system (Chart 28). For every bank that borrows from the Bank intraday, another has an intraday deposit—it is a closed system. Partly for this reason, actual borrowing from the Bank during the day is always considerably lower than the total collateral held by the Bank against settlement banks' potential borrowing.

Chart 28
Intraday liquidity and the stock of refinancing(a)



(a) Monthly averages.
(b) Monthly averages of maximum intraday collateral posted in CHAPS sterling less maximum intraday borrowing.
(c) Monthly average of each day's maximum intraday borrowing in CHAPS sterling.

Both intraday and in OMOs, the Bank lends against high quality euro as well as sterling-denominated debt securities. During the latest quarter, the Bank's counterparties made increased use of euro-denominated collateral against the Bank's lending in OMOs (Chart 29). This was despite some apparent increase in

Management of the Bank's sterling bond portfolio

A central bank's balance sheet is unique due to its role as the monopoly supplier of central bank money. Located on the liability side of the central bank's balance sheet, central bank money acts as the final settlement asset for all payments made in the economy and includes banknotes together with banks' settlement or reserve account balances.

On the other side of the balance sheet, central banks vary in their choice of assets. But they are typically of a high quality so that, consistent with a stability-oriented monetary policy regime, the integrity of central bank money is assured. In many cases, a portion of assets is rolled over at short maturities, not only in order to implement monetary policy decisions but also to accommodate fluctuations in demand for central bank money, thereby aiding banking system liquidity management.

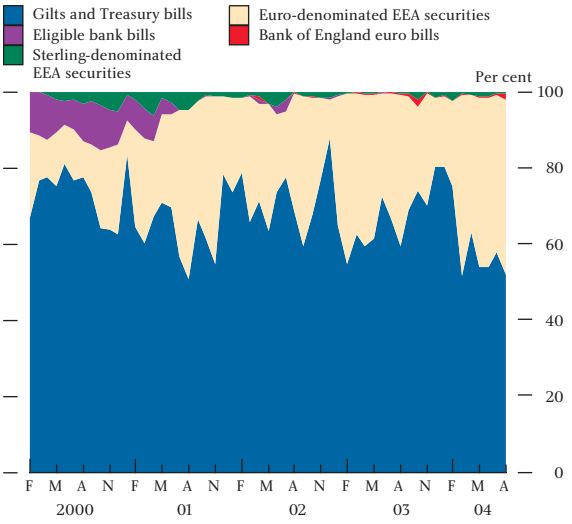
In addition to domestic-currency money market assets held in order to implement monetary policy, central banks also generally hold a portfolio of bonds, usually largely government and other low credit risk bonds.

In normal circumstances, central banks typically hold the portfolio of bonds on a 'buy and hold' basis, so that the liquidity of the central bank balance sheet is primarily managed by allowing money market assets (in the form of short-term reverse repos) to rise or fall as demand for central bank liabilities changes. Occasionally, if changes in demand for central bank money are sufficiently large, the central bank may be forced to sell some of its bond portfolio.

The Bank of England currently holds a portfolio of British government securities (currently around £1.8 billion) and other high quality sterling debt securities (£1.2 billion). On 1 September 2004, the Bank announced some changes to the way in which it executes the management of this portfolio.

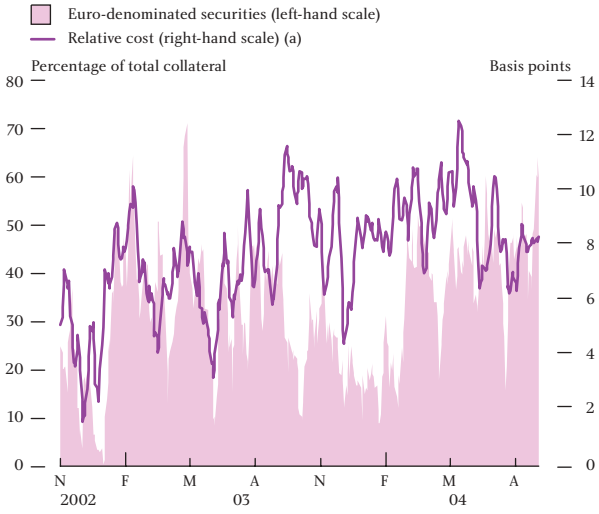
On the first working day of each quarter of the Bank's financial year (September, December, March, June), the Bank will announce details and amounts of the securities it will purchase in the following quarter. The announcement will be made at 3 pm on the Bank's wire service screen pages.

Chart 29
Instruments used as OMO collateral(a)



(a) Monthly averages.

Chart 30
Relative cost and use in OMOs of euro-denominated EEA government securities

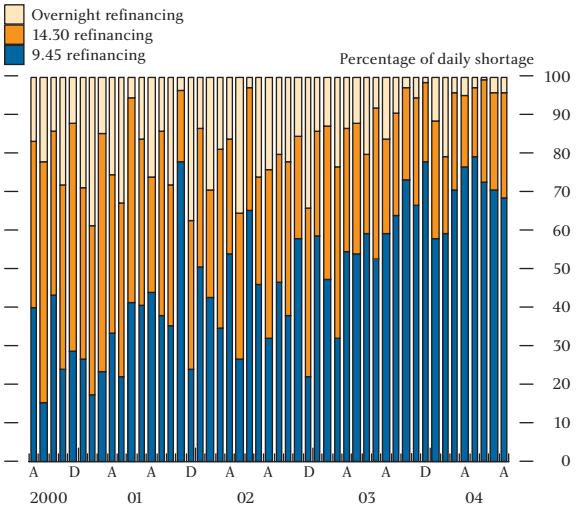


(a) Relative cost calculated as difference between one-month BBA repo and Libor fixing spread and one-month European Banking Federation repo and Euribor spread. A larger spread indicates a lower cost of repoing euro-denominated debt relative to repoing gilts.

its relative cost compared with sterling-denominated collateral over the review period (Chart 30). One likely explanation is that counterparties made less use of the Bank's overnight late lending facilities, with the great majority of refinancing through OMOs provided at two-week maturities in the 9.45 and 14.30 rounds (Chart 31). Due to settlement timetable constraints, euro-denominated government debt securities cannot be delivered as collateral against late lending unless

prepositioned by counterparties with the Bank. Greater use of two-week OMOs is likely to be connected to the more stable overnight market rates observed in recent months.

Chart 31
Refinancing provided in the Bank's open market operations(a)

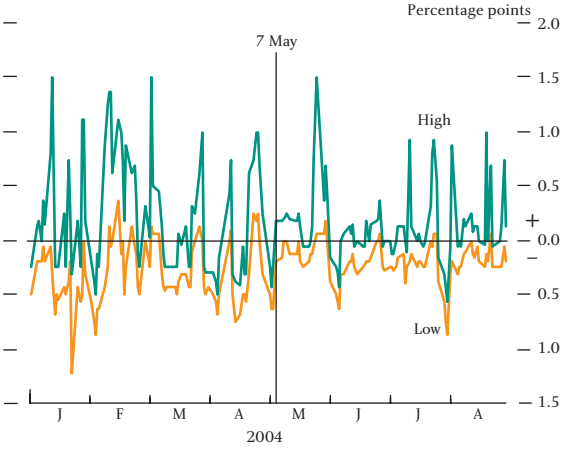


(a) Monthly averages.

Short-dated interest rates

Following the Bank's publication on 7 May 2004 of a paper reviewing its operations in the sterling money market,(1) volatility of sterling overnight interest rates has continued to fall (Chart 32). In that paper, the Bank set out its objectives for reform of its operations, including the need to reduce significantly the volatility of overnight interest rates. Contacts have reported that the reduced levels of volatility observed in recent months have already improved liquidity, encouraging some firms to participate in the overnight interbank market for the first time.

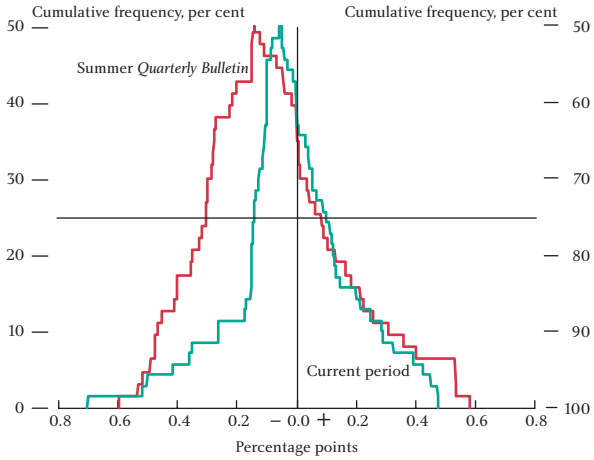
Chart 32
Volatility of sterling overnight interest rate(a)



(a) High and low of the day observed by the Bank's dealing desk as a spread to the policy rate.

Chart 32 shows that there has also been a reduction in the size of the spread between the daily highs and lows of sterling unsecured overnight interest rates. Compared with the period covered by the Summer *Quarterly Bulletin*, the average of this spread has fallen from 38 basis points to 33 basis points over the current review period. The distribution of sterling secured (GC repo) overnight rates has also become closer to that of the MPC's repo rate—the spread between the two rates is now more evenly distributed and narrower overall, as indicated by the interquartile range(2) (Chart 33). This range has been 24 basis points over the current review period, compared with 38 basis points over the period covered by the Summer *Quarterly Bulletin*.

Chart 33
Cumulative folded distribution of sterling secured overnight rates(a)



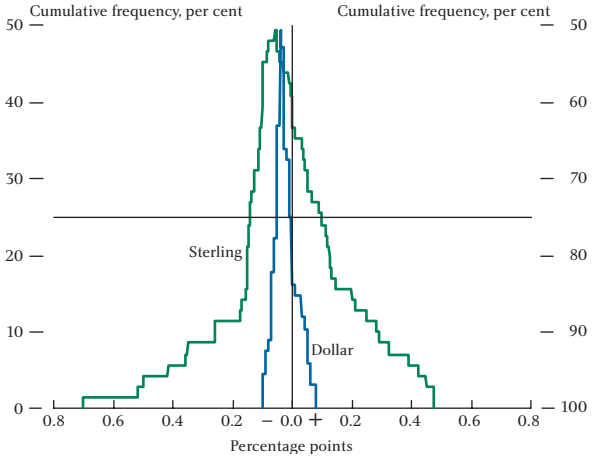
(a) Distribution of the spread between the GC repo rate and the MPC's repo rate. A negative spread indicates that the market rate is less than the official rate; if more than 50% of the spread distribution is below zero, it has a negative skew.

Despite this improvement, there remains a significant difference between the distribution of the GC repo/MPC repo spread and the analogous distribution for dollar rates (Chart 34). This is at least partly due to the additional volatility arising in sterling money market rates near to meetings of the MPC when market participants perceive a high probability of a change in the Bank's repo rate. As discussed in the Summer *Quarterly Bulletin*, this feature, known as 'pivoting', will be

(1) See 'Reform of the Bank of England's operations in the sterling money markets' (2004), *Bank of England Quarterly Bulletin*, Summer, pages 217–27.
(2) The interquartile range covers the region of the distribution between 75% and 25% of all spread values. In effect, it measures the volatility of spreads around Bank repo but excluding extreme spreads. Graphically the interquartile range is given by the difference in spread values when the horizontal line cuts the distributions at the 25% and 75% cumulative frequency.

eliminated as part of the Bank of England's planned reforms. More generally, the residual volatility is not acceptable over the medium term. Pending the introduction of the reforms, it is important that market participants continue to support lower volatility.

Chart 34
Cumulative folded distributions of sterling and dollar secured overnight rates(a)



(a) Distribution of the spread between the sterling and dollar market rates and the relevant official rates. A negative spread indicates that the market rate is less than the official rate; if more than 50% of the spread distribution is below zero, it has a negative skew.

The Bank announced the main results of its review of its operations in the sterling money markets on 22 July; the Bank will adopt a reserve-averaging system, with voluntary reserves remunerated at the MPC's repo rate. At the core of the new framework will be standing lending and deposit facilities, available at 25 basis points either side of the repo rate on the final day of the maintenance period, and at a wider spread on other days. Under the new system, the Bank will conduct weekly open market operations at a one-week maturity. The Bank plans to issue a further paper in the autumn, consulting on detail.

Forecasting the liquidity shortage

There was a significant improvement in the accuracy of the Bank's daily liquidity forecast during the latest period (Table E). In part, this reflected significantly lower seasonal volatility in note demand than during the previous period, which contained both Easter and early-May Bank Holidays.

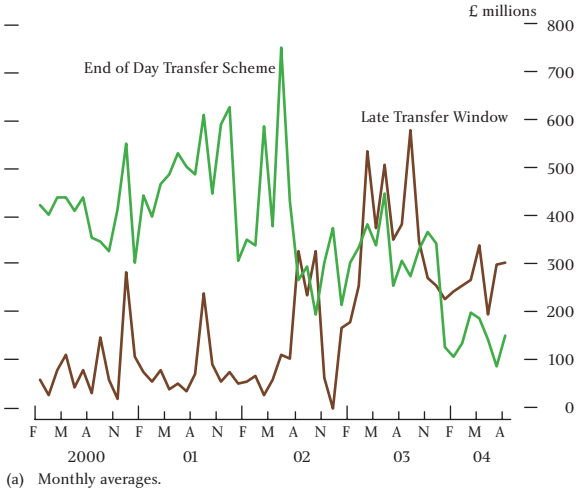
Table E
Intraday forecasts versus actual liquidity shortages

Mean absolute difference (standard deviation), £ millions

	9.45 forecast	14.30 forecast	16.20 forecast
2002	83 (107)	43 (79)	30 (73)
2003	101 (123)	61 (96)	51 (85)
2003 Q1	80 (74)	45 (54)	33 (31)
2003 Q2	119 (131)	54 (76)	38 (43)
2003 Q3	118 (170)	92 (154)	85 (150)
2003 Q4	87 (91)	52 (57)	46 (36)
2004 Q1	120 (108)	79 (77)	55 (43)
2004 Q2	115 (123)	58 (78)	61 (74)
July-Sept. 2004	84 (68)	58 (44)	50 (26)

Perhaps consistent with similar improvements in the forecasting accuracy of the settlement banks, there was a decrease in use of both the End of Day Transfer Scheme (EoDTS) and the Late Transfer Window (LTW) by the settlement banks (Chart 35).(1) Use of both these facilities has been falling since 2003, a development that is welcome to the Bank.

Chart 35
Use of the Late Transfer Window and EoDTS(a)



(a) Monthly averages.

(1) For a description of the EoDTS, see page 163 of the Summer 2003 *Quarterly Bulletin*, or the APACS web site: www.apacs.org.uk/downloads/EoDT.pdf, and of the LTW, see page 40 of the Winter 2003 *Quarterly Bulletin*.