

# Markets and operations

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

- *Market developments were consistent with expectations of a stronger global economic recovery: bond yields rose sharply, while corporate bond spreads narrowed and equity indices rose.*
- *US dollar interest rates were particularly volatile, with changes amplified by heavy mortgage hedging activity.*
- *Sterling appreciated against the euro and depreciated against the US dollar and Japanese yen, leaving the effective rate fairly stable.*
- *Expectations for further official interest rate reductions in the United Kingdom receded.*
- *Issuance of new dematerialised money market instruments in the CREST system started on 15 September; the migration of outstanding instruments into CREST began. The Bank issued new notices on eligible debt securities and certificates of deposit in London.*

Since the end of May, government bond yields have been highly volatile, and have risen sharply, especially in the United States and Japan, as optimism has grown about the outlook for global economic recovery. Major equity indices have risen and corporate bond spreads narrowed further, consistent with signs of economic recovery or reduced risk premia. The US dollar and Japanese yen appreciated against the euro (Table A).

**Table A**  
**Summary of changes in market prices**

	30 May	5 Sept.	Change
<b>December 2003 three-month interest rate future (per cent)</b>			
United Kingdom	3.41	3.86	45 bp
Euro area	2.02	2.19	17 bp
United States	1.16	1.19	3 bp
<b>Ten-year nominal government forward rate (per cent) (a)</b>			
United Kingdom	4.71	4.97	26 bp
Euro area	5.32	5.41	9 bp
United States	5.76	6.93	117 bp
<b>Equity indices</b>			
FTSE 100 index	4048	4257	5.2%
Euro Stoxx 50 index	2350	2615	12.2%
S&P 500 index	964	1021	6.0%
<b>Exchange rates</b>			
Sterling effective exchange rate	97.8	99.1	1.3%
\$/€ exchange rate	1.18	1.10	-6.2%
¥/€ exchange rate	141	129	-8.4%

Sources: Bank of England and Bloomberg.

(a) Six-month forward rates, derived from the Bank's government liability curve. 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](http://www.bankofengland.co.uk/statistics/yieldcurve/main.htm).

The rise in US bond yields triggered large-scale mortgage-hedging activity, which reinforced, or exaggerated, the rise in US dollar yields.

## Expectations for economic recovery

Over the period, Consensus economic growth forecasts for 2004 were revised upwards a little for the United States, Japan and the United Kingdom, but despite recent improvements in some forward-looking confidence measures, euro-area forecasts were generally revised downwards (Chart 1).

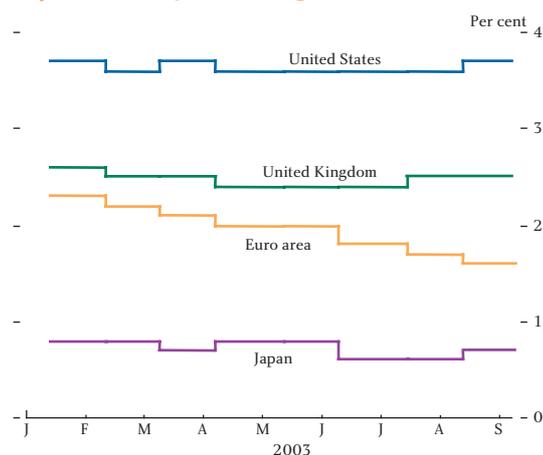
US, UK and euro-area nominal forward rates, all of which had continued to fall in early June, subsequently rose, and continued to increase through July and much of August. Changes were more pronounced for US nominal forward rates (Chart 2) and, over the period as a whole, these showed the largest increase (Chart 3).

## Rise in US bond yields

That the fall and rise in US dollar nominal forward rates far exceeded those for euro and sterling interest rates is, perhaps, unsurprising. Market participants suggested

(1) The period under review is from 30 May (the data cut-off for the previous *Bank of England Quarterly Bulletin*) to 5 September.

**Chart 1**  
Expected 2004 real GDP growth



Source: Consensus Economics.

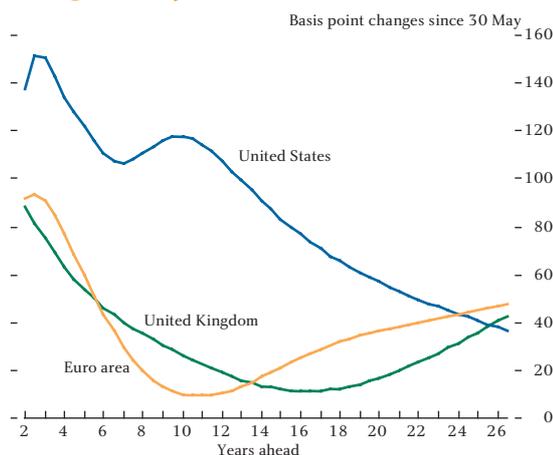
**Chart 2**  
Six-month UK, US and German rates seven years forward<sup>(a)</sup>



(a) Derived from the Bank's government liability curves.

that some of the decline in interest rates in early June reflected speculation that the Federal Reserve might purchase US Treasury bonds in so-called 'unconventional' monetary policy measures, in order to inject reserves were the zero nominal interest rate bound reached. These trades started to be unwound as economic data were interpreted as suggesting stronger signs of economic recovery in the United States than had been expected previously. There was more selling after the FOMC announcement on 25 June and Chairman Greenspan's testimony on 15 July, interpreted as further reducing the probability of unconventional

**Chart 3**  
Changes in implied nominal forward rates<sup>(a)</sup>



(a) Six-month forward rates derived from the Bank's government liability curves.

monetary policy steps. But contacts also attributed some of the difference in US dollar, euro and sterling interest rates to the effects of hedging in the US mortgage market.

In the United States, many mortgage loans are packaged up into 'mortgage-backed securities' (MBS), a significant proportion of which are held by government sponsored enterprises (GSEs) including Fannie Mae (FNMA) and Freddie Mac (FHLMC).<sup>(1)</sup> Holders of these assets receive the cash flows from the underlying mortgages, most of which are lent at fixed rates of interest. But borrowers also have the right to repay their mortgages before the due date. When this happens, holders of MBS receive the early repayment, but their exposure to interest rate risk—the 'duration'<sup>(2)</sup> of their assets—decreases. If their liabilities are principally non-callable, such that their duration falls only steadily towards redemption, holders of MBS will face a 'duration gap'.<sup>(3)</sup>

To hedge this risk, individual MBS holders may be able to issue callable bonds or enter into swaption transactions, a 'static' hedge. But because the US household sector is a very large net holder of the prepayment option, the financial system is unable, in aggregate, to hedge this risk completely—there is insufficient demand for callable bonds and insufficient supply of swaptions.<sup>(4)</sup> Alternatively, to manage their

(1) For information about GSEs, see Box 5 of the *Bank of England Financial Stability Review*, June 2000, pages 54–55.

(2) Duration (or 'modified duration') captures the sensitivity of the value of the asset with respect to the interest rate—it is a measure of interest rate risk.

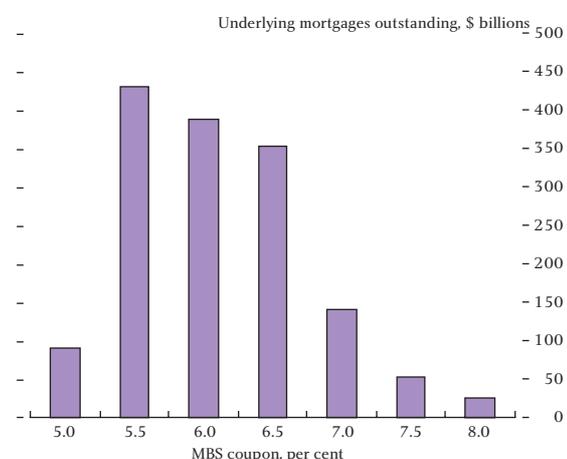
(3) Mortgage servicers, who either originate mortgages themselves or buy the servicing rights from other originators, face a different type of risk. They collect mortgage payments in return for a service fee, an income flow that is highly sensitive to remortgaging. They tend to manage this risk by holding 'principal-only' strips of MBS.

(4) Swaptions are options on forward-looking interest rate swaps. A swaption gives the buyer the right (but not the obligation) to enter into an interest rate swap at a specific date in the future, at a particular fixed rate and for a specified term. Market contacts also reported that other investors, such as some US commercial banks, chose to adjust their interest rate risk exposure by selling MBS. The yield spread over US Treasuries of the current coupon 30-year FNMA MBS rate also widened sharply in late July/early August. Large US banks had increased their holdings of MBS in recent years, potentially exposing them to greater prepayment risk. See *Bank of England Financial Stability Review*, June 2002, page 34.

interest rate risk, individual MBS holders may attempt to shift the duration of other elements in their balance sheet when the prospective duration of their MBS holdings changes—this is referred to as ‘dynamic’ hedging. For example, to offset falls in the duration of MBS assets, investors will tend to acquire additional exposure to long-term rates by buying Treasury bonds or receiving the fixed leg in interest rate swaps. This additional demand for bonds or for the fixed side of swaps will in itself tend to raise their prices—and lower medium to long-term yields—at least temporarily.

The probability of remortgaging activity depends on the relationship between current mortgage rates and the interest rates on existing mortgages. Interest rates on existing mortgages will reflect earlier episodes of remortgaging (Chart 4). If current mortgage rates are far away from these levels, changes in current mortgage rates will not make much difference to the probability of remortgaging. But as current rates fall towards and then reach or fall below the levels at which previous refinancing took place, the probability of remortgaging rises rapidly, and so too will dynamic hedging activity which, as described above, will tend to drive long interest rates down further. Similarly, as mortgage rates rise towards the rates being paid on existing mortgages, the probability of early redemption can fall rapidly, leading investors to sell US Treasury bonds, or pay fixed in swaps, which in itself will temporarily push yields even higher. So mortgage-hedging activity can amplify yield movements arising for other reasons, but will not always do so.

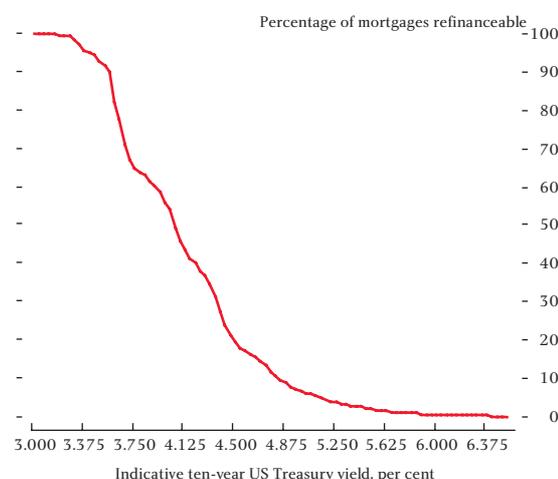
**Chart 4**  
Distribution of FNMA and FHLMC mortgage rates



Source: Bloomberg.

Between mid-June and mid-August, the benchmark ten-year US Treasury yield increased from 3.11% to 4.56%. At the same time, the 30-year mortgage rate rose from 4.99% to 6.22%. On some estimates, this rise reduced the proportion of mortgages that could be refinanced profitably from around 90% in June to under 20% in early September (Chart 5). Contacts said that mortgage hedging was partly responsible for the rise in yields, reinforcing the rise driven by improved expectations of the economic outlook and adjusted perceptions of the prospects for unconventional monetary policy measures.

**Chart 5**  
Estimated refinancing risk profile for FNMA MBS



Source: Merrill Lynch.

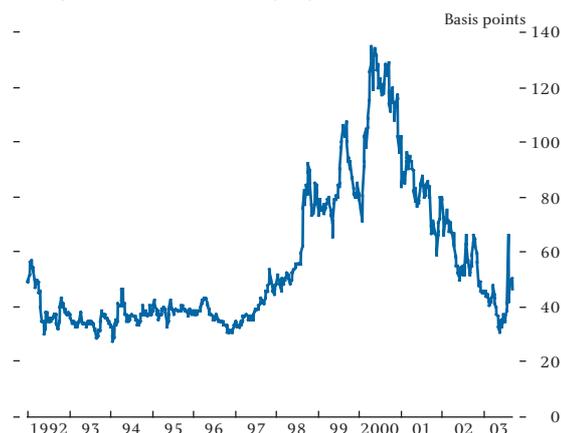
US dollar swap rates also rose sharply—the increase in the ten-year rate in July (114 basis points) was the largest monthly change since at least 1988. The spread between US dollar swaps and US Treasury yields temporarily widened (Chart 6), indicating that a larger amount of hedging activity took place in the swap market than in the Treasury market.<sup>(1)</sup> By early September, the ten-year spread had returned to March levels.

The shift towards hedging in swaps over recent years, and the increase in swap market liquidity, in part reflected the falling supply of US Treasury marketable debt between 1997 and 2000 when there were federal budget surpluses in the United States.

Rising government debt has become an increasing element of the domestic counterpart to the US external deficit. Since the decline in equity markets from their peaks in 2000, the external deficit has been largely financed by overseas purchases of US Treasury bonds

(1) Unlike, for example, in February 1994. For a discussion of that period of intense mortgage hedging activity, see Fernald, J D, Keane, F and Mosser, P C, ‘Mortgage security hedging and the yield curve’, *Federal Reserve Bank of New York Quarterly Review*, Summer-Fall 1994.

**Chart 6**  
Ten-year US dollar swap spread



Source: Bloomberg.

and US Agency debt, especially in Asia, where foreign exchange reserves have accumulated.<sup>(1)</sup> Given increased US Treasury debt issuance, US dollar swap spreads might have narrowed further had there not been heavy demand for highly rated US dollar denominated fixed income. A combination of these factors affected financial conditions and, for example, featured in the UK government's decision to issue US dollar-denominated debt in June (see the box on pages 262–63).

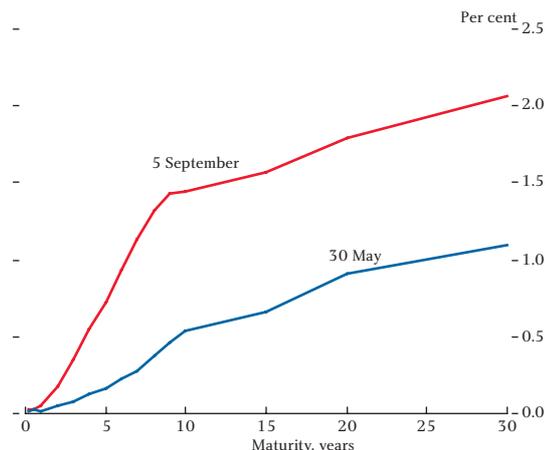
The Japanese government bond (JGB) market was also driven by distinctive factors over the period. Japanese yen interest rates (Chart 7) rose in two main phases: in June, on tentative signs of economic recovery, and in August, following much stronger-than-expected Q2 GDP data (Chart 8). While market participants noted technical factors at times—such as selling of JGBs by Japanese banks as the rise in yields increased 'value at risk' exposures, with the effect of extending moves further—these phases were also reflected in the Japanese equity market, which rose sharply over the period. That might point to increased expectations of economic recovery in Japan.

Increased volatility in Japanese bond yields brought some increase in yen swaption volatilities (Chart 9). It is perhaps surprising that they had fallen to such low levels in recent years, given the amount of uncertainty that exists about medium to long-run Japanese inflation.

### Short-term interest rates

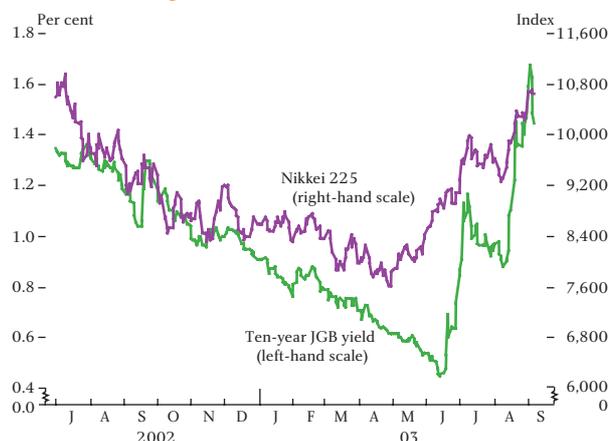
As in the bond market, short-term interest rates (STIR) implied by the futures market also fell and then rose, ending the period substantially higher, at least at

**Chart 7**  
Japanese government yield curve



Source: Bloomberg.

**Chart 8**  
Ten-year Japanese government bond yield and Nikkei 225 index



Source: Bloomberg.

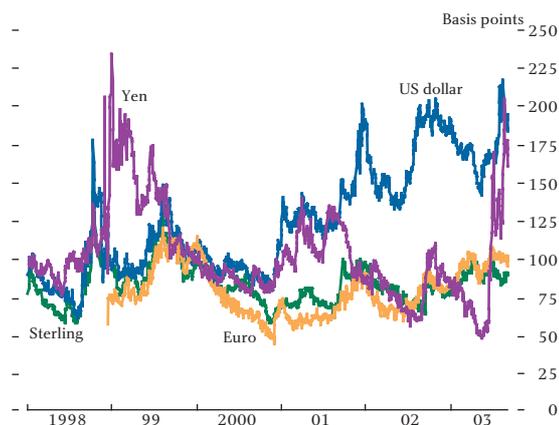
maturities two years ahead (Chart 10). The turnaround in implied rates in June and July was similarly dramatic (Chart 11). Some speculative players were said to have had large positions borrowing short term and investing or lending at longer maturities, in a 'search for yield'.<sup>(2)</sup> With the rise in yields, contacts reported that many of these positions were closed out, triggering stop-loss limits and perhaps selling, extending the upward movement in short-term interest rates.

Interestingly, open interest in short sterling futures (the number of contracts outstanding) grew slightly in late July and early August as new positions were put on. This was in marked contrast to March 2003, when a sharp rise in near-term short sterling rates was accompanied by a sudden fall in open interest in a somewhat disorderly liquidation of long speculative positions that had been built up prior to the Iraq war.

(1) See Bank of England Financial Stability Review, June 2003, pages 48–49.

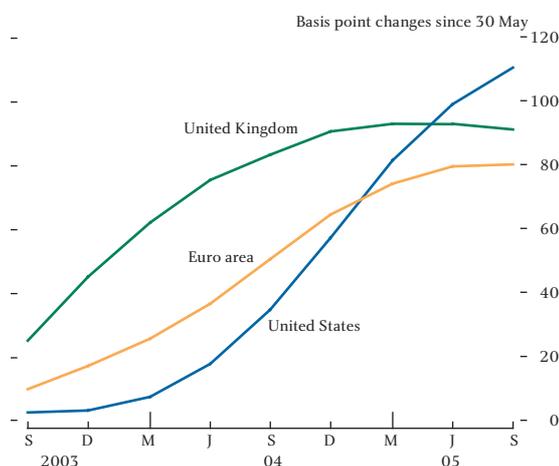
(2) See Bank of England Financial Stability Review, June 2003, page 11.

**Chart 9**  
Option-implied volatility of three-month into ten-year swaptions



Sources: Bloomberg and Merrill Lynch.

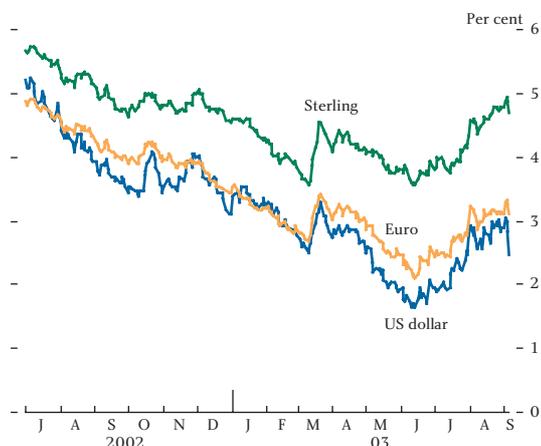
**Chart 10**  
Changes in short-term interest rate expectations<sup>(a)</sup>



Source: Bloomberg.

(a) As implied by short-term interest rate futures contracts.

**Chart 11**  
Three-month interest rates implied by December 2004 STIR futures<sup>(a)</sup>

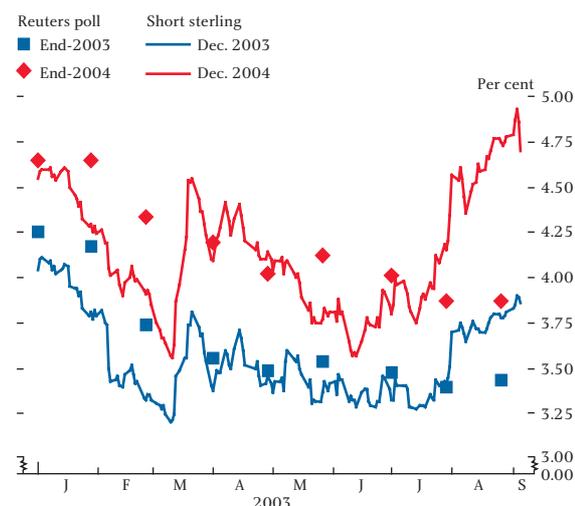


Source: Bloomberg.

(a) As implied by short-term interest rate futures contracts.

The sharp rise in sterling short-term interest rates, particularly on 31 July and 1 August, was initially viewed as a spillover effect from US dollar markets, but these movements have not unwound. Rather, contacts report a marked change in view, with most market participants now not expecting the Bank's Monetary Policy Committee (MPC) to reduce the repo rate below its current level (Chart 12). The MPC reduced the repo rate by 0.25 percentage points to 3.5% on 10 July. Most economists and market contacts expect that rate to hold at least until end-2003. The difference between market rates and the average of economists' central forecasts for end-2004 is large, however. As of 26–28 August, the average surveyed forecast of the Bank repo rate was 3.87%, while the December 2004 short sterling contract implied a three-month cash rate of 4.74%. That difference could reflect an increased risk or term premium in short sterling futures contracts.

**Chart 12**  
UK rate expectations from short sterling futures and surveys of economists



Sources: Bloomberg and Reuters.

The market's uncertainty about the outlook for interest rates may be reflected in measures of implied volatility from interest rate options contracts. But care is needed over the units in which volatility is measured. Implied volatility itself is quoted as a percentage of the underlying interest rate. On this basis, uncertainty in the United Kingdom has for some time been comparable to that in the euro area but considerably lower than in the United States (see Chart 13). This is potentially misleading, however, as the level of interest rates is higher in the United Kingdom. If implied volatility is measured in terms of basis points,<sup>(1)</sup> then it is rather

(1) Quoted level of implied volatility multiplied by the underlying interest rate.

## Issuance of HM Government US dollar bond

On 23 June, on behalf of HM Treasury (HMT), the Bank of England launched the issue by the UK government of a \$3 billion 2<sup>1</sup>/<sub>4</sub>% 5-year eurobond. This was the first UK government dollar-denominated bond since 1996, and its first foreign currency issue since 2000. The issue was undertaken as part of the ongoing refinancing of the United Kingdom's foreign exchange reserves, and was brought to take advantage of market conditions that made it a cheaper form of financing the reserves than sterling issuance via gilts. Although sterling debt management was transferred to the Debt Management Office in 1998, the Bank has remained the government's agent for foreign currency debt, as it is used to finance the United Kingdom's foreign exchange reserves, which are managed by the Bank on behalf of HMT.

The issue was announced by the lead managers and joint book-runners—Citigroup, Deutsche Bank, Goldman Sachs and Morgan Stanley—early in Asian trading on 23 June. It was formally launched at 10 am in London, and the order book closed in the early afternoon. The bond was priced later that day at a spread of just 2 basis points over the yield on the 5-year US Treasury benchmark. Adjusting for the difference in maturity dates between the UK bond and the US Treasury benchmark, this represented a spread more than 3 basis points below the Treasury curve. That compared with a spread above the benchmark Treasury of 5 basis points (equivalent to 4.8 basis points on a curve-adjusted basis) for the United Kingdom's previous dollar issue, the \$2 billion 6<sup>3</sup>/<sub>4</sub>% 5-year eurobond in July 1996.

The Bank and HMT keep options for financing the reserves under review, comparing the relative value for money of gilt and foreign currency borrowing. The policy is set out each year in HMT's *Debt and Reserves Management Report* (DRMR). The DRMR for 2003–04, published on 9 April 2003, stated that:

*'For 2003–04, foreign currency borrowing continues to be an option for financing the reserves. The UK's last dollar borrowing was in 1996 and the last euro borrowing in 2000. As then, the Bank of England would manage the issuance of the foreign currency liability, under the authorisation of HM Treasury. The justification for*

*renewed foreign currency borrowing would be to obtain better value-for-money, compared with the cost of financing through gilts, on an equivalent currency-swapped basis.'*<sup>(1)</sup>

In assessing the value-for-money of a potential dollar issue, the Bank and HMT compared estimates of the cost of a dollar issue swapped into floating-rate dollars, against the cost of issuing a gilt of equivalent maturity currency swapped into floating-rate dollars (via a sterling fixed-for-floating interest rate swap and a cross-currency basis swap). In theory, funding arbitrage should ensure that there is no difference between the common-currency costs to the United Kingdom of issuing debt denominated in sterling or in dollars.<sup>(2)</sup> In practice, however, borrowers sometimes find that they are able to borrow at a lower cost by issuing debt in a particular currency. Among the ways in which this type of arbitrage has been seen to occur are cases in which the issuer is better-known to investors in one market than another, or if there is especially strong demand by investors for assets denominated in a particular currency. In general, funding arbitrage of this sort is most likely to be experienced by large and well-known issuers, such as sovereigns, supranationals, and multinational corporations.

It followed from this that there were three issues for the Bank and HMT to weigh when considering a potential dollar issue. First, there was the currency-swapped cost of gilt issuance in terms of floating-rate \$ Libor. Second, the level of US swap spreads, one measure of which is a US Treasury benchmark bond swapped into floating-rate \$ Libor. And third, an estimate of the expected spread over the Treasury benchmark bond of the prospective UK dollar bond.

Chart A shows UK and US 5-year swap spreads from 1997 to date. US swap spreads rose in 1999, and remained wide in the first half of 2000, both in absolute terms and relative to other markets (on a currency-adjusted basis). In large part this appears to have reflected expectations of a continuing improvement in the US fiscal position and of net repayments of US government debt. Swap spreads

(1) Page 29 of the DRMR, available on the United Kingdom Debt Management Office web site, [www.dmo.gov.uk/remmit/1/remmit.htm](http://www.dmo.gov.uk/remmit/1/remmit.htm).

(2) See, for example, the box 'International funding arbitrage', *Bank of England Quarterly Bulletin*, May 2000, pages 130–31.

**Chart A**  
Five-year sterling and US dollar swap spreads



Source: Bloomberg.

subsequently edged lower in both the United States and the United Kingdom, as expectations grew that the slowdown in global activity would result in higher supply of government debt. The recent opportunity for the UK government to issue a dollar-denominated bond at a lower cost than gilt financing was facilitated in part by the widening differential between UK and US swap spreads that re-emerged in early 2003. As the chart shows, however, there had been periods in the past few years when the differential had been at least as wide as in the most

recent period. However, the third element of the value-for-money consideration, the expected spread of a UK government dollar bond over the comparable US Treasury benchmark, was judged to be less favourable in that period. As part of its routine liaison with the market, the Bank receives regular advice from investment banks on the expected spread. Estimates of the spread were based in large part on the spreads over US Treasuries of other high-grade bonds in the sovereigns, supnationals and agencies sector—including, until its maturity, the 1996 UK dollar bond. These spreads generally widened in the period when US swap spreads were widening, and gradually narrowed in subsequent years as swap spreads declined.

Within this framework for considering value for money and of broad market developments, the Bank monitored shorter-run market conditions to see if a favourable opportunity to issue could be identified. In recent months, this suggested that there was considerable interest for high-quality fixed-rate dollar exposure, and that this demand was moving along the maturity spectrum as the yield curve flattened and investors were 'searching for yield'. It was against this background that the UK government decided to launch the issue on 23 June.

**Chart 13**  
Non-normalised six-month option-implied volatility of short-term interest rates



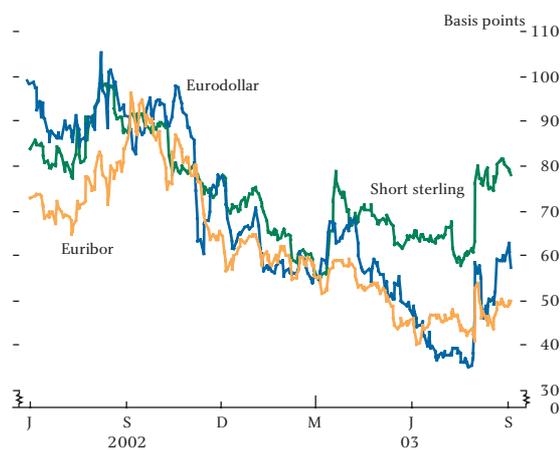
Sources: Bank of England, CME, Eurex and LIFFE.

higher for sterling interest rates than for dollar or euro rates (see Chart 14). But the level of sterling implied volatility is close to its average since 1997.

## Spreads and equities

The rise in bond yields was partly reflected in higher investment-grade corporate bond yields; non-investment grade yields were stable or lower. Credit spreads fell

**Chart 14**  
Normalised six-month option-implied volatility of short-term interest rates

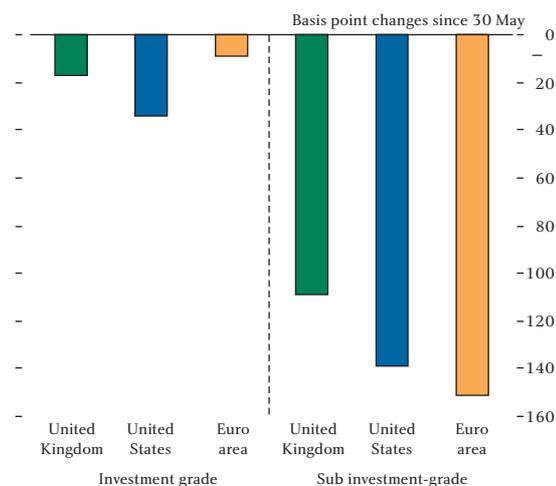


Sources: Bank of England, CME, Eurex and LIFFE.

over the period (Chart 15), suggesting that—despite some increases in the cost of capital—perceptions about corporate risk improved, consistent with perceptions of a stronger economic outlook. Declines were broad-based, across industry groups.

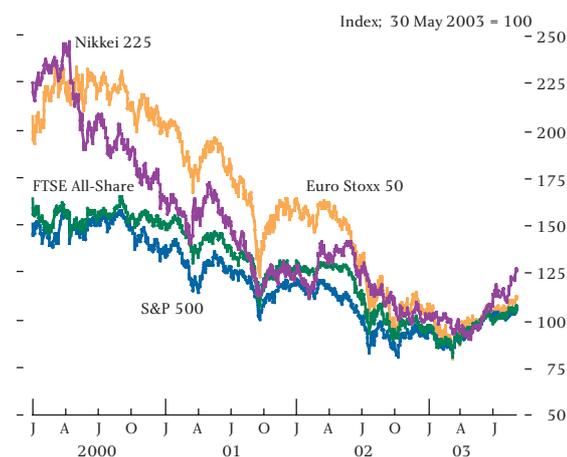
Equity indices rose over the period, most notably in Japan (Chart 16). Other things being equal, higher interest rates associated with improved prospects for

**Chart 15**  
Spreads over swaps of international investment and sub investment-grade corporate bonds



Source: Merrill Lynch.

**Chart 16**  
Selected equity indices



Source: Bloomberg.

economic growth might have been expected to lead to falls in equity values as future dividends are discounted at higher rates. That equity indices rose might therefore also be consistent with expectations of greater corporate profitability, reflected in future dividend growth or reduced risk premia. Second-quarter US earnings were generally above market estimates.

In the United Kingdom, the increase in small-capitalisation equity indices has been greater than for the larger FTSE 100 index (Chart 17). A number of factors might have contributed to this difference. First, the FTSE 100 and 250 indices have a different sectoral composition—for example there is a larger IT component in the FTSE 250, and sectoral IT sub-indices have increased strongly globally. However, the IT sectors are relatively small. Second, the FTSE 250 index has a greater proportion of constituent companies

**Chart 17**  
FTSE 100 and 250 indices



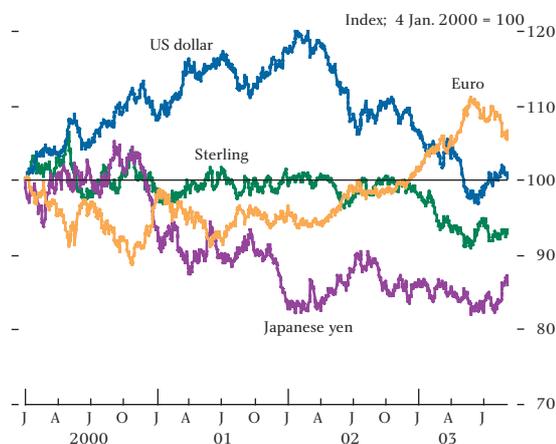
Source: Bloomberg.

regarded as having cyclical earnings than the FTSE 100, so might be expected to see greater fluctuations over the business cycle. The larger rise in the FTSE 250 would therefore be consistent with upwardly revised expectations to economic growth. And third, the difference may be driven by a greater reduction in the risk premium demanded for holding smaller-capitalisation stocks than FTSE 100 stocks.

**Exchange rates**

Major exchange rates have been stable in effective terms relative to the sharp movement in global bond yields (Chart 18). However, there were larger moves in bilateral exchange rates: the US dollar and Japanese yen appreciated against the euro by around 7% and 9%, respectively, consistent with market anecdote of a renewed focus on relative growth expectations.

**Chart 18**  
Effective exchange rates



Some market participants also note that previous US dollar depreciation had been concentrated against only

a limited number of currencies—including sterling and the euro—because dealers seeking to short the US dollar could not take that position effectively against currencies that were pegged to the US dollar or where there was significant central bank intervention. Data from the Chicago Mercantile Exchange suggest that the more recent US dollar appreciation against the euro has been accompanied by a reduction in speculative net long euro-US dollar positions. So fluctuations in the US dollar-euro exchange rate may have been amplified by fixed pegs elsewhere, leaving the effective US dollar exchange rate index relatively stable.

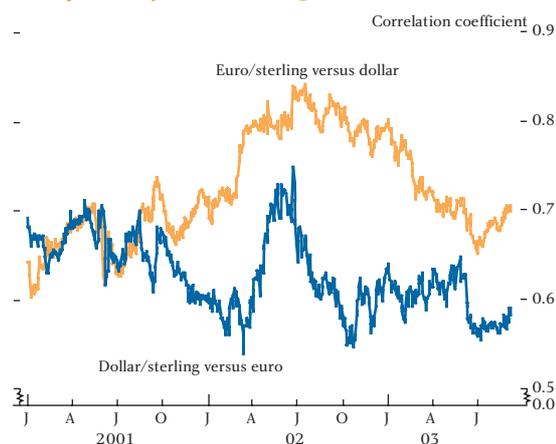
The sterling ERI rose by 1.3% over the period as a whole (Chart 19), with sterling appreciation against the euro largely offset by depreciation against the US dollar. Implied volatilities remained low for sterling and other currency pairs, notwithstanding macroeconomic uncertainty. One-year implied euro-sterling and dollar-sterling correlations fell slightly over the period as a whole (Chart 20).

**Chart 19**  
Sterling effective exchange rate



Table B decomposes exchange rate movements according to the uncovered interest parity (UIP) condition, which seeks to assess the impact of interest rate news on the exchange rate.<sup>(1)</sup> Interest rate news here is measured as the change in the differences between ten-year UK and overseas government bond yields. Assuming constant medium-term exchange rate expectations and exchange rate risk premia, a fall in relative UK interest rates would be expected to lead to an immediate depreciation in sterling's exchange rate followed by a gradual

**Chart 20**  
One-year implied exchange rate correlations



Source: UBS.

**Table B**  
Exchange rate movements and news:  
30 May–5 September

	£ ERI	€/£	\$/£	\$/€
Actual change (per cent)	1.39	3.16	-3.21	-6.17
Interest rate news (percentage points)	-0.17	0.78	-4.78	-5.57
of which: domestic	4.34	4.34	4.34	3.56
foreign	-4.52	-3.56	-9.13	-9.13

appreciation. The direction of sterling's exchange rate against the euro and US dollar was consistent with relative interest rate news, though the magnitude of these changes was not.

In June and July, sterling appeared to move independently of the euro and US dollar rate. Market contacts reported that this in part reflected 'carry trades' that were put on in June but taken off in July, after the MPC reduced the Bank's repo rate.<sup>(2)</sup>

## Developments in market structure

This section provides an update of some significant changes in market infrastructure, as well as developments in sterling instruments and trading patterns.

### Continuous Linked Settlement

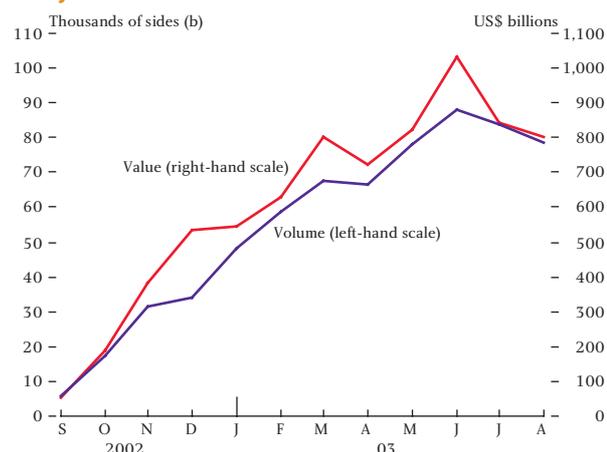
Both the volume and value of foreign exchange transactions settling through Continuous Linked Settlement (CLS) have risen for most of the twelve months of its operation (Chart 21).<sup>(3)</sup>

(1) See Brigden, A, Martin, B and Salmon, C (1997), 'Decomposing exchange rate movements according to the uncovered interest rate parity condition', *Bank of England Quarterly Bulletin*, November, pages 377–89.

(2) Carry trades involve borrowing in one currency and investing in a higher-yielding one with the aim of earning the interest rate difference. For a description of carry trades, see 'Markets and operations', *Bank of England Quarterly Bulletin*, Summer 2003, page 156.

(3) CLS, operated by CLS Bank International, was launched on 9 September 2002. See *Bank of England Quarterly Bulletin*, Autumn 2002 (pages 257–58) and Winter 2002 (pages 365–66) and the *Bank of England Financial Stability Review*, December 2002 (pages 82–85).

**Chart 21**  
**Daily settlement volumes and values in CLS<sup>(a)</sup>**



Source: CLS Bank International.

- (a) Monthly averages.  
 (b) Each trade consists of two sides.

Its activities continue to expand. Four new currencies were introduced on 8 September: the Danish krone, Norwegian krone, Swedish krona and Singapore dollar. Settlement of the New Zealand dollar, Hong Kong dollar and Korean won, and an extension of settlement to fund managers' foreign exchange trades is expected to begin in 2004.

While CLS has brought major benefits through a reduction in settlement risk, its introduction was closely monitored by market participants in case it affected money markets liquidity. On the one hand, CLS settlement members' ability to fund their gross obligations on a net basis was expected to reduce settlement flows in CLS currencies and improve liquidity. But on the other hand, the need to make payments on a strict timetable might potentially have complicated treasurers' intraday cash management.

In fact, in most CLS currencies neither effect has been observable. For example, analysis by the Bank suggests that there has been little impact on the flows through CHAPS Sterling.<sup>(1)</sup> There are several possible explanations.

- Before CLS was launched, many CLS settlement members were members of bilateral netting systems, such as FXNet. The impact on gross flows of a shift from bilateral to multilateral netting may have been less marked than expected.
- There may have been a general increase in the volume and value of FX trading in both CLS and non-CLS currencies.

- CLS has introduced a new element of tiering—and hence perhaps additional payment legs—into FX settlement, with CLS settlement members providing settlement services to third-party users.
- Not all settlement members are yet using CLS settlement for all their branches.

Nor has there been any appreciable impact on the euro and US dollar high-value payment systems. Interestingly, though, there has been a material reduction in values and volumes in the Japanese Foreign Exchange Yen Clearing System, a system dedicated to clearing yen payments arising from cross-border transactions. It is not clear why CLS's impact on yen flows should apparently differ from its impact on other currencies.

CLS has not had any obvious detrimental effect on banks' intraday sterling cash management. There has been little or no increase in collateral posted to raise intraday liquidity in CHAPS Sterling since CLS's introduction, and disruptions to CLS arising from late or failed pay-ins have been rare.

#### Settlement of money market instruments

Work to dematerialise money market instruments, which will reduce settlement risk in sterling money markets by allowing securities to be settled on the basis of delivery-versus-payment in central bank money, is nearing completion. This follows several years' preparation by market participants, CRESTCo and the Bank of England and the necessary legislative amendments.

On 15 September, the Central Moneymarkets Office (CMO) lodging counter closed to new issues of money market instruments (MMIs) such as certificates of deposit (CDs), Treasury bills and bankers' acceptances. At the same time, issuance of equivalent securities, electronic debt securities (EDS), into CREST began. The process of migrating outstanding MMIs from CMO to CREST started with the transfer of euro-denominated securities on 22 September, and will continue with Treasury bills beginning to be transferred on 29 September, bankers' acceptances on 6 October and certificates of deposit (CDs) on 13 October.

Issuers and holders have also been able to 'move' instruments into CREST ahead of migration dates since 15 September through the early maturity of instruments

(1) See the box 'Assessing the impact of CLS on CHAPS Sterling', *Bank of England Financial Stability Review*, June 2003, pages 81–82.

held in CMO with issuance of equivalent securities in CREST.

Holder, issuer, intermediaries, issuing and paying agents and settlement banks should be fully prepared for these migration processes. The Bank has issued a brief note on preparations agreed between market practitioners for the migration of CDs.<sup>(1)</sup> Market participants with any questions on migration issues should approach their issuing and paying agents or CRESTCo.

Following the closure of the full CMO transfer service, the Bank will no longer take as collateral in its sterling money market operations any remaining physical money market securities.<sup>(2)</sup>

### New eligible bankers' acceptance and CD notices

Reflecting the introduction of EDSs in CREST, the Bank issued on 27 August a new notice for eligible bankers' acceptances (the non-material equivalents of eligible bank bills) and a new notice on limit calculations for eligible banks; on 9 September the Bank issued an updated list of eligible banks.<sup>(3)</sup>

The Bank also issued on 29 August, on behalf of the Sterling Money Markets Liaison Group, a new notice on issues of certificates of deposit in London,<sup>(4)</sup> replacing the Bank of England Notice of 1 November 1996.

A 'London CD' will now be issued with a minimum denomination (or Minimum Transfer Amount in the case of EDSs) of £100,000 or its foreign currency equivalent. Above this minimum amount, CDs issued as EDSs may be transferred in units of one penny or any higher unit value specified by the issuer. This is in line with the International Primary Market Association/International Paying Agents Association conventions on sterling/euro certificates of deposit/euro commercial paper issuance.

The new notices should be read in conjunction with the publication 'Preparing for the dematerialisation of MMIs' by the British Bankers' Association of 29 August.<sup>(5)</sup>

### Developments in major UK banks' wholesale funding

The major UK banks have issued larger amounts of CDs in recent years as their domestic loan books have grown more rapidly than retail deposits.<sup>(6)</sup> They have also made greater use of sterling bond issuance and asset securitisation and, increasingly, foreign currency debt issuance with proceeds converted into sterling via the foreign exchange swap market.

Much of this foreign currency debt issuance has been in the money markets. Table C shows the growth in net borrowing by the major UK banks in foreign currency money markets between December 1998 and June 2003, split into debt issuance, borrowing from other banks and borrowing via local offices.<sup>(7)</sup> The greater increase in borrowing has been in currencies other than euro, primarily US dollar. Contacts have confirmed that several UK banks have increased considerably their issuance of US dollar certificates of deposit and commercial paper and their borrowing in the US dollar interbank markets. They have been taking advantage of the depth of these markets and the attractiveness to US money market investors of diversifying their credit risk by lending to highly rated, overseas banks.

**Table C**  
**Major British Banking Groups' net borrowing in foreign currency money markets<sup>(a)</sup>**

£ billions	Dec. 1998	Jun. 2003	of which:	
			€	Other
CDs and CP issued net of held	12.0	49.4	7.2	42.2
Net from overseas offices (b)	-3.9	9.8	-14.0	23.7
Net from other overseas banks (b)(c)	6.1	32.9	11.3	21.6
<b>Total</b>	<b>14.2</b>	<b>92.1</b>	<b>4.5</b>	<b>87.5</b>

(a) From banks' unconsolidated returns. Only includes banking groups which were members of MBBG throughout. For details of the composition of the MBBG, see the British Bankers' Association web site, [www.bba.org.uk](http://www.bba.org.uk). Positive numbers indicate net borrowing.

(b) Deposits and repos net of loans and reverse repos.

(c) Other than central monetary institutions and non-resident offices of the reporting institution.

In order to convert short-term US dollar liabilities to sterling, banks sell US dollars for sterling in the spot foreign exchange market with a simultaneous forward purchase of US dollars for sterling. These foreign exchange swaps might typically mature at the same time as the bank's underlying US dollar money market liability. Chart 22 shows the flows involved in such a transaction.

(1) See [www.bankofengland.co.uk/markets/money/cdsmigration.pdf](http://www.bankofengland.co.uk/markets/money/cdsmigration.pdf).

(2) For the Bank's notice on transition arrangements, see [www.bankofengland.co.uk/markets/money/transnotice030911.pdf](http://www.bankofengland.co.uk/markets/money/transnotice030911.pdf).

(3) See [www.bankofengland.co.uk/markets/money/eliglist.pdf](http://www.bankofengland.co.uk/markets/money/eliglist.pdf).

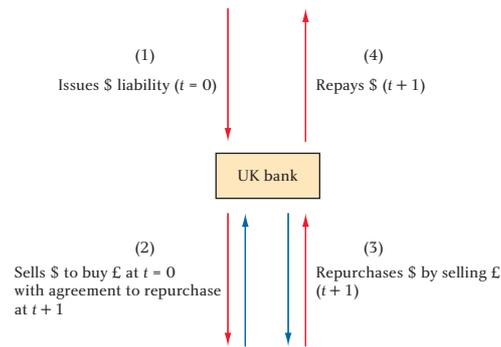
(4) See [www.bankofengland.co.uk/markets/money/cdnot001.pdf](http://www.bankofengland.co.uk/markets/money/cdnot001.pdf).

(5) See [www.bba.org.uk/pdf/144289.pdf](http://www.bba.org.uk/pdf/144289.pdf).

(6) Between December 1998 and June 2003, major UK banks' domestic sterling loans to non-banks increased by over 55%; non-bank domestic sterling liabilities increased by around 35%.

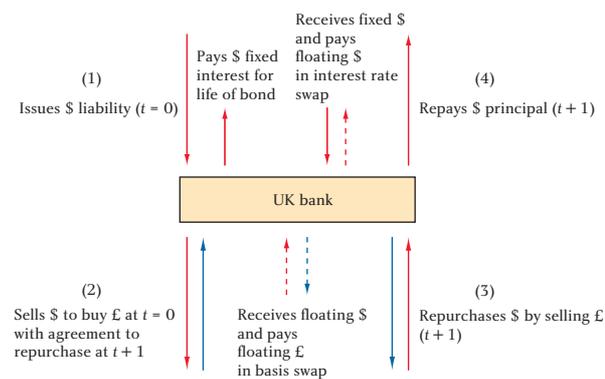
(7) In fact, banks' overseas offices may raise only part of their funds from money markets, but it is not possible to isolate this in the data.

### Chart 22 Stylised foreign exchange swap to convert US dollar liability<sup>(a)</sup>



(a) Amounts returned in (3) reflect interest rate differential. It is possible to structure the transaction so that the dollar payments net off exactly. The sterling payments are adjusted accordingly.

### Chart 23 Stylised cross-currency interest rate swap to convert US dollar liability<sup>(a)</sup>



(a) The bank might ensure that net US dollar flows sum to zero, leaving it with a sterling exposure only. There are many ways to structure the transaction.

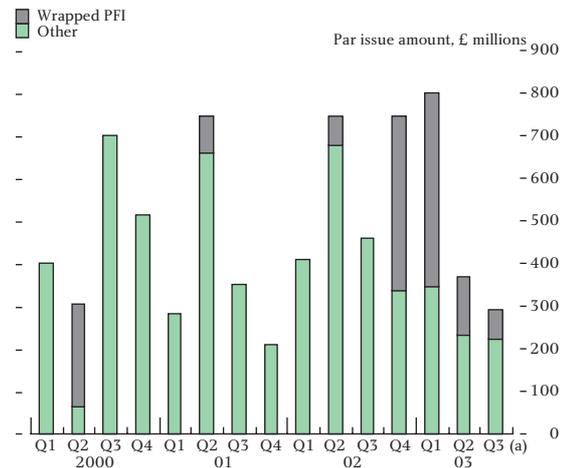
Where banks issue longer-maturity foreign currency debt, they may also convert the proceeds to sterling using the foreign exchange swap market, requiring them to roll over the swaps periodically. Alternatively, they might enter into longer-term swaps, including basis swaps in which floating-rate sterling payments are exchanged for floating-rate payments in the foreign currency (Chart 23).

Using overseas money markets diversifies UK banks' sources of wholesale funding and is said to have lowered funding costs. To the extent that it becomes a permanent element of their funding the banks are reliant on continuous liquidity in the foreign exchange swap markets.

### Private finance initiative-related inflation-indexed bond issuance

In addition, sterling market contacts have reported significant growth in recent years in the issuance of inflation-indexed bonds by borrowers other than the UK government. A large part of this increase has been due to bonds issued to finance projects under the Private Finance Initiative (PFI), typically for the construction and maintenance of new buildings (such as hospitals) or transport infrastructure (Chart 24). These projects often issue inflation-indexed debt because the future revenue stream from the sponsoring government body (for example, National Health Service trusts or government departments) to the project company is linked to the retail prices index.

### Chart 24 Issuance of inflation-indexed non-gilt sterling bonds



Sources: Bank of England, Dealogic, MBIA Insurance Corporation and Royal Bank of Scotland.

(a) July and August only.

Typically, equity investors in the project company cover about 10% of the project costs, with the remainder raised as debt. The company sub-contracts construction and facilities management, but does retain some specific project risks, such as contractor failure, insurance costs and some maintenance and operating cost overruns. Finance may be provided by banks or through the bond market, with smaller or shorter-term deals more likely to be bank-financed.

Recently, many bonds have featured a financial guarantee 'wrap' provided by a monoline insurer so that they are AAA-rated.<sup>(1)</sup> The monolines also take on project risk, reviewing the structure of underlying

(1) Known as 'monolines' because they specialise in credit insurance. See Rule, D. 'Risk transfer between banks, insurance companies and capital markets: an overview', *Bank of England Financial Stability Review*, December 2001, page 148.

contracts and taking action if projects do not meet performance criteria. Large investors in sterling non-government inflation-indexed debt may, therefore, accumulate concentrations of exposure to the monolines, but with any exposure limited to the difference between the value of the wrapped bonds and the underlying claims on the PFI project companies. UK pension funds are thought to be the largest investors in sterling inflation-indexed bonds in order to match pension liabilities indexed to the retail prices index.

## Bank of England official operations

### Changes in the Bank of England balance sheet

Table D summarises changes in the components of the Bank's balance sheet between 28 May and 3 September. These were largely driven by increases in customer deposits in both sterling and foreign currencies.

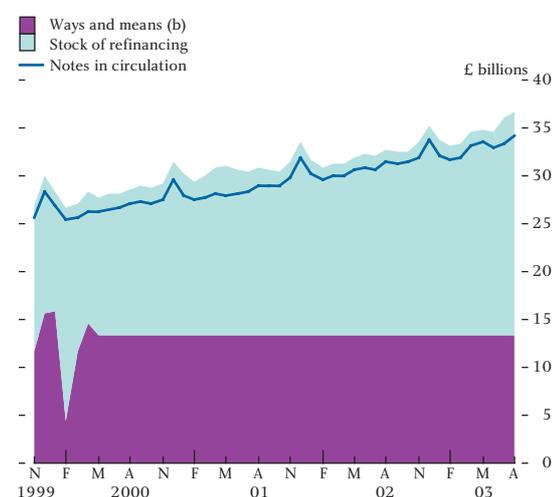
The Bank maintained the nominal value of its three-month and six-month euro-denominated bills outstanding at €3.6 billion by rolling over bills at maturity. The average issuance spread for three-month bills was 11.2 basis points below euribor, compared with 12.9 basis points in the previous period (March-May); and for six-month bills was 14.4 basis points below euribor, compared with 15.3 basis points in the previous period. These slightly narrower spreads might reflect weaker demand for euro-denominated government bills following the reduction in the ECB's official interest rate on 5 June.

Currency in circulation was broadly unchanged over the period as a whole. Within the period, the size of note issuance followed normal seasonal patterns, declining in June as the effects of the May Bank Holiday unwound, but picking up in the run-up to the August Bank Holiday. These patterns are easier to predict than at Easter and Christmas. Consequently, the Bank did not consider uncertainty in the notes forecast sufficient to warrant an increase in the amount of the banking system's liquidity need held over from the 9.45 to the

14.30 rounds of open market operations (the cushion against intraday downward revisions to the forecast shortage).

But also within the period, the change in the stock of refinancing at times exceeded the change in notes in circulation (Chart 25). This largely reflected transactions arranged by the Bank to increase the size of the banking system's liquidity shortage on particular days, in the light of behaviour of short-dated interest rates relative to the official repo rate. The size of the banking system's daily liquidity shortage therefore increased in August, though this also reflected in part greater recourse to the Bank's overnight lending facilities (Chart 26).

**Chart 25**  
Bank notes in circulation, the stock of refinancing and 'Ways and Means'<sup>(a)</sup>



- (a) Monthly averages.  
(b) An illiquid advance to HM Government held constant since the transfer of the responsibility for UK central government cash management to the UK Debt Management Office in April 2000.

Gilts continued to constitute the largest part of the collateral against which the Bank's monetary operations are secured (Chart 27).

The Bank announced a number of minor adjustments to its operations in the sterling money markets during the period (see the box on page 270).

**Table D**  
Simplified version of Bank of England consolidated balance sheet<sup>(a)</sup>

£ billions					
Liabilities	3 Sept.	28 May	Assets	3 Sept.	28 May
Bank note issue	33	33	Stock of refinancing	23	21
Settlement bank balances	<0.1	<0.1	Ways and Means advance	15	15
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	7	5	Other sterling-denominated assets	4	3
Foreign currency denominated liabilities	12	11	Foreign currency denominated assets	12	11
<b>Total (b)</b>	<b>52</b>	<b>49</b>	<b>Total (b)</b>	<b>52</b>	<b>49</b>

- (a) Based on published weekly Bank Returns.  
(b) Figures may not sum to totals due to rounding.

## Adjustments to the Bank's official operations in the sterling money markets

Following consultation with market participants, the Bank announced on 27 August a number of adjustments to its operations in the sterling money market, which took effect on 15 September.

The Bank:

- Put in place transition arrangements to end the eligibility of bills accepted by one bank but drawn by another. Such bills did not exist on any scale before the Bank lifted its requirements on bill clausing in March 2000 for use in the Bank's official operations and in RTGS. The Bank prefers to provide liquidity to the banking sector against the collateral of high-quality claims outside the banking sector.
- Ceased providing collateral against its overnight deposit facility. In practice, collateralisation had

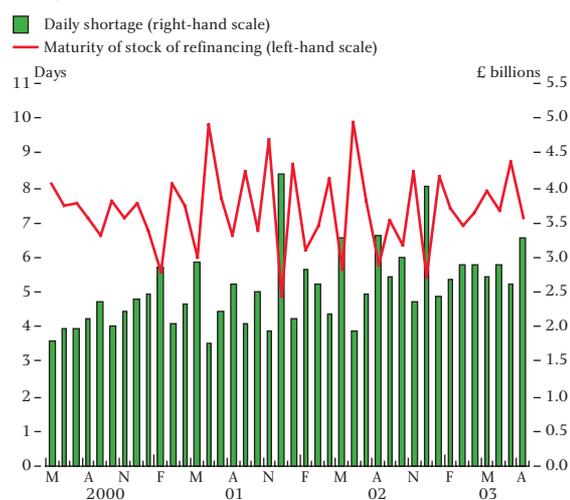
led to offers of deposits motivated by a desire to borrow gilt collateral rather than to deposit cash. That was not the intended purpose of the facility.

- For non-sterling denominated eligible collateral, moved the valuation time from 9 am the same day to 4 pm the previous day and increased the foreign exchange component of the initial margin from 2% to 3%.
- Introduced daily publication of the maturity dates of bills purchased outright in the Bank's official sterling market operations.

Further details, including transition arrangements for bank-on-bank bills and the Bank's revised Operational Notice, are available on the Bank's web site.<sup>(1)</sup>

(1) See [www.bankofengland.co.uk/markets/money/publications.htm](http://www.bankofengland.co.uk/markets/money/publications.htm).

**Chart 26**  
Maturity of stock of refinancing and size of daily shortage<sup>(a)</sup>

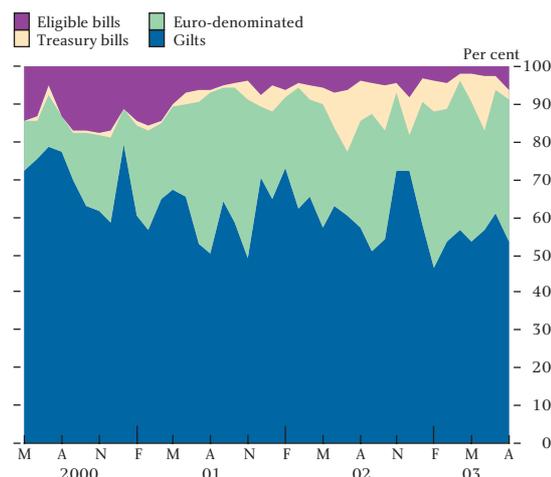


(a) Monthly averages.

### Forecasting the liquidity shortage

The accuracy of the Bank's liquidity forecast has been largely in line with that in previous months, but there was a deterioration in late July (Table E). This largely related to problems with the introduction by the Bank of new processes and a new IT system to support its banking operations. There were some delays in the transfer and reporting of some large-value payments—between the Bank and the CHAPS system—which affected the Bank's banking and public sector customers. The Bank's open market operations and sterling money market conditions were unaffected.

**Chart 27**  
Instruments used as OMO collateral<sup>(a)</sup>



(a) Monthly averages.

**Table E**  
Intraday forecasts versus actual shortages

Mean absolute difference (standard deviation), £ millions

	9.45 forecast	14.30 forecast	16.20 forecast
2000 (a)	121 (96)	99 (64)	103 (56)
2001	98 (205)	56 (51)	30 (73)
2002	85 (107)	43 (82)	30 (73)
2003 Q1	80 (73)	46 (54)	33 (29)
Apr. 2003	167 (183)	68 (119)	39 (51)
May 2003	114 (119)	46 (37)	46 (45)
June 2003	84 (56)	51 (51)	30 (35)
July 2003	143 (261)	126 (237)	111 (238)
Aug. 2003	104 (69)	61 (44)	66 (50)

(a) From April 2000.