

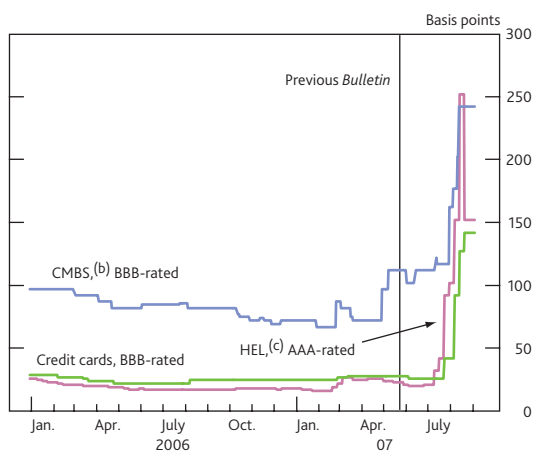
Markets and operations

This article reviews developments in sterling financial markets since the 2007 Q2 *Quarterly Bulletin* up to the beginning of September, which was a period of stress in international financial markets. It also reviews the Bank's official operations during this period. A fuller evaluation of the significance of financial market developments will be included in the Bank's *Financial Stability Report*, to be published on 25 October 2007.

International influences on sterling markets⁽¹⁾

A broad deterioration of conditions across credit markets was associated with increased volatility and impaired liquidity in global financial markets more generally in the review period. The trigger was renewed concerns about the US sub-prime mortgage market in June, following an earlier episode of stress in February and March this year.⁽²⁾ This resulted in the near failure of two large hedge funds in the United States. Efforts by the creditors of these two funds to realise the value of the collateral they held, in order to limit their exposure to the funds, raised concerns about secondary market liquidity and the valuation of all, but especially senior (AAA-rated), tranches of asset-backed securities (ABS) of US sub-prime mortgages, and of collateralised debt obligations (CDOs) containing those tranches.

Chart 1 Spreads on US asset-backed securities^(a)



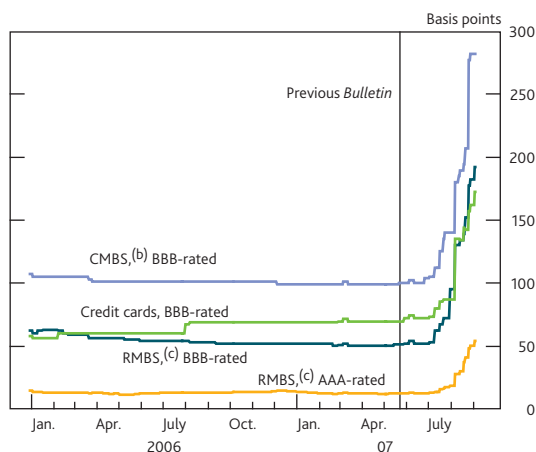
Source: Lehman Brothers.

- (a) Three-year sterling floating rates over one-month Libor.
 (b) Commercial mortgage-backed securities.
 (c) Home equity loans.

As investors reconsidered the risks associated with sub-prime ABS, there was a widespread repricing of securitised products

more generally, including US mortgage-backed securities (MBS) of higher credit standing; MBS in other countries, including the United Kingdom; and ABS backed by other receivables such as credit card payments (Charts 1 and 2).

Chart 2 Spreads on UK asset-backed securities^(a)



Source: Lehman Brothers.

- (a) Five-year sterling floating rates over Libor.
 (b) Commercial mortgage-backed securities.
 (c) Residential mortgage-backed securities.

In part, these wider developments seemed to reflect a loss of investor confidence in the ratings given to such securities by rating agencies; and also the difficulty of assessing the level and composition of the risks underlying complex portfolios of such instruments. Secondary market prices of all tranches fell sharply, and contacts described the primary market as largely closed.

The near closure of primary markets for CDOs of ABS was accompanied by a sharp drop in issuance of collateralised loan obligations (CLOs). CLOs had been reported by contacts to

(1) This section focuses on sterling market developments. The data cut-off for this section was 7 September 2007.
 (2) See April 2007 *Financial Stability Report*, pages 20–25 and 2007 Q2 *Quarterly Bulletin* page 194.

account for more than half of the investor base for leveraged loans, which are loans issued by non-investment grade companies. The significance of this was that, when demand from CLOs dried up, it shut off the pipeline for the distribution of loans arising from leveraged buyouts (LBOs) of companies by private equity firms. Some of these LBOs, in both the United States and Europe, were of considerable size. Banks that had underwritten the loans had then to hold on their own balance sheets, rather than distribute, the exposures arising from these 'hung deals'. Market intelligence suggested that in early September the aggregate size of such exposures in Europe and the United States might be of the order of \$450 billion (£225 billion).

The impact of the unexpected balance sheet expansion arising from hung LBOs, and uncertainty surrounding valuations of CDOs of ABS, prompted banks and dealers to reduce risk by tightening the terms on which these assets could be financed. This put further strain on some leveraged investors.

Investors may be leveraged in different ways. They may employ balance sheet leverage: that is, borrow to finance the purchase of an asset, for example, in the repo market. Or they may obtain leverage by exposure to a financial instrument that embodies leverage, such as derivatives. In both cases, the effect is to increase (decrease) the net worth of the investor by a multiple of the rise (fall) in price of the asset or the asset referenced by the derivative contract. So as asset prices fell and financing terms tightened, these investors had to deleverage. Some CDOs of ABS with sub-prime exposure could not be financed at all and 'haircuts' — margin payments leveraged investors pay their brokers for financing — were raised across assets. As liquidity deteriorated, banks and dealers raised haircuts further and the triparty repo market,⁽¹⁾ an important source of funding for some leveraged investors, effectively closed for a time. Higher margin payments added to pressure on leveraged investors to sell assets and, in turn, to downward pressure on CDO prices.

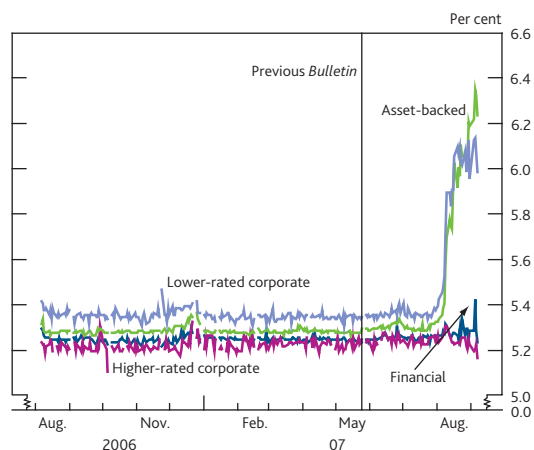
One of the dominant types of leveraged investor in the senior tranches of ABS and CDOs had been off balance sheet vehicles: conduits and structured investment vehicles (SIVs).⁽²⁾ As spreads widened, it became clear that the asset quality of some of these vehicles had deteriorated. Those invested in securities backed by sub-prime mortgages attracted particularly significant attention. Investors became reluctant to invest in the short-term debt issued by these vehicles, known as asset-backed commercial paper (ABCP). The box on page 348 provides more detail on the type of conduits that issue ABCP and discusses the maturity mismatch associated with their method of funding.

As demand for ABCP dissipated, it became more likely that conduits and SIVs would call on committed liquidity lines from banks.⁽³⁾ SIVs without such support were particularly

vulnerable; and some were forced to restructure. But all ABCP issuers found themselves having to roll over their funding at very short maturities. As a result, many banks were faced with the sudden and uncertain prospect of having to bring effectively, or actually, the assets back onto their own balance sheets at a time when they were already holding loans arising from hung LBO deals. They therefore faced the prospect of having to hold on their balance sheets various consumer assets that would usually be securitised and sold.

The banks' demand for liquidity increased against this prospective or actual expansion of their balance sheets, resulting in a preference to hold 'cash' at very short maturities. In combination with uncertainties about the location of losses on exposures to sub-prime assets, banks became reluctant to lend to each other beyond short-term maturities. And contacts suggested that other wholesale investors also became reluctant to lend in the money markets at term maturities, as they sought to preserve their own liquidity. This, in conjunction with the increasing amounts of ABCP being rolled over at very short maturities, created the prospect of a gathering 'snowball' of funding having to be rolled over every day in the overnight or short-term money markets, which had previously been funded at term maturities of a few months. There was also a dislocation in yields of longer-term ABCP versus other types of commercial paper (CP) that was rolled (Chart 3). This put considerable strain on money markets internationally, heightening the vulnerability of the financial system to further shocks.

Chart 3 Yields on US longer-term commercial paper^(a)



Source: Board of Governors of the Federal Reserve System.

(a) 30-day commercial paper.

- (1) In a triparty repo, a third-party custodian (typically a bank or clearing organisation) acts as an intermediary between the parties in a repo agreement. This reduces the administrative burden for investors and provides smaller market participants, who may not have sufficient infrastructure to conduct bilateral repo transactions, with access to repo funding.
- (2) For more detail on types of specialist financing vehicles, see the speech by Paul Tucker entitled 'A perspective on recent monetary and financial system developments', 2007 Q2 *Quarterly Bulletin*, pages 310–16.
- (3) The risk that banks may have been underpricing committed liquidity facilities to commercial paper (CP) issuers has been noted in previous issues of the Bank's *Financial Stability Review*. See for example, June 2002, pages 67–68.

ABCP-funded vehicles

The rapid growth in securitisation over the past decade, and particularly in the past three years, has led to a rise in issuance of short-term instruments, backed by the cash flow of other assets, known as asset-backed commercial paper (ABCP). Like more traditional commercial paper issued by banks and non-financial corporates, ABCP is a money market instrument with a maturity of no longer than one year.

In a securitisation, assets are sold to a special purpose vehicle (SPV), which issues securities backed by the cash flows on its assets. When the securities issued are ABCP, the SPV is typically known as an ABCP conduit.

ABCP conduits

The first conduits funded entirely by ABCP appeared in the mid-1990s. Since then, the market has grown rapidly; in 2007 Q2 global ABCP outstanding totalled \$1.48 trillion. Many (but not all) ABCP conduits are sponsored by large commercial banks. There are typically two main motivations for setting up a conduit. First, by issuing highly rated short-term notes, conduits can obtain a funding advantage for their sponsoring banks. Second, by selling assets to a conduit and shrinking its balance sheet, a bank will generally gain regulatory capital relief.

By funding a portfolio of longer duration assets with short-term paper, ABCP conduits perform a maturity transformation. That means that they are exposed to the risk that they are unable to reissue (or 'roll') maturing ABCP.

In order to assign high ratings (A1/P1) to the ABCP issued by a conduit, rating agencies typically require conduits to have committed liquidity lines from highly rated commercial banks to cover the full amount of commercial paper (CP) issued so that ABCP investors do not incur losses in the event that CP cannot be rolled. Most ABCP conduits are structured with liquidity support to cover at least 100% of the value of ABCP issued. As well as liquidity lines, ABCP conduits usually have some form of credit enhancement to shield investors from credit risk. This may take the form of over-collateralisation (where the value of assets exceeds the amount of ABCP issued) or a guarantee of repayment from a sponsoring or other highly rated commercial bank.

ABCP conduits can be classified into a 'programme type' depending on their function and the assets they hold. Broadly, there are five programme types:

Single-seller; sponsored by a bank or finance company that is the sole originator of the conduit's assets — the sponsor uses the vehicle for the benefit of its primary business.

Multi-seller; typically sponsored by a bank but also purchases assets from many different sellers — used to provide financing for the sponsor and its clients.

Credit arbitrage; sponsored by a bank to finance the purchase of highly rated securities, typically ABS/CDO tranches, at low interest rates to earn a spread.

Hybrid; sponsored by a bank to invest in securities and provide financing for the sponsor and its clients.

Repo/TRS; sponsored by a non-bank — the conduit takes exposure to assets via repo or total return swap (TRS) agreements typically with highly rated financial counterparties.

Structured investment vehicles

A structured investment vehicle (SIV) is a special type of credit arbitrage conduit. A SIV is a leveraged investment company that raises capital by issuing capital market securities (capital notes and medium-term notes) as well as ABCP. ABCP typically comprises around 20% of the total liabilities for the biggest SIVs.

A variant of a SIV is a so-called SIV-lite. SIV-lites share some similarities with collateralised debt obligations (CDOs) in that they are closed-end investments. SIV-lites issue a greater proportion of their liabilities as ABCP than SIVs (around 80%–90%), are typically more highly leveraged, and seem to have invested almost exclusively in US RMBS. As a consequence, several SIV-lites have restructured their liabilities following the recent turmoil in US mortgage markets.

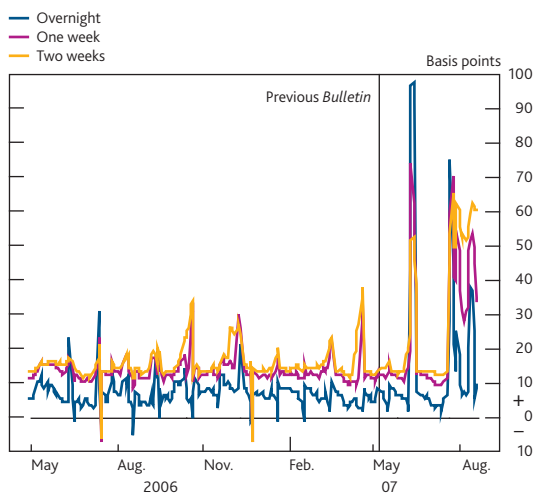
Unlike conduits that issue only ABCP, SIVs and SIV-lites tend not to have committed liquidity lines from banks that cover 100% of their ABCP. Rather, they use capital and liquidity models, approved by ratings agencies, to manage liquidity risk. The lack of a full commercial bank guarantee has reportedly led to discrimination against SIV paper by ABCP investors.

Recent developments in sterling markets

The resulting strains in money markets were seen not only in the dollar and euro markets, in which the bulk of the ABCP had been issued, but also in sterling markets. This was most significant in term markets, but also featured in very short maturity markets.

Spreads to Bank Rate of sterling overnight and other short-term secured and unsecured interest rates widened to higher levels than those seen on average since the Bank's reforms of May 2006 to its official money market operations (Chart 4). On 5 September, before the beginning of the maintenance period starting after the September Monetary Policy Committee (MPC) meeting, the Bank announced measures that it was prepared to take in pursuit of its objective that interest rates on secured overnight borrowing should be close to Bank Rate set for that period by the MPC. For a fuller discussion, see pages 358–60.

Chart 4 Spread to Bank Rate of short-term unsecured sterling interest rates^(a)

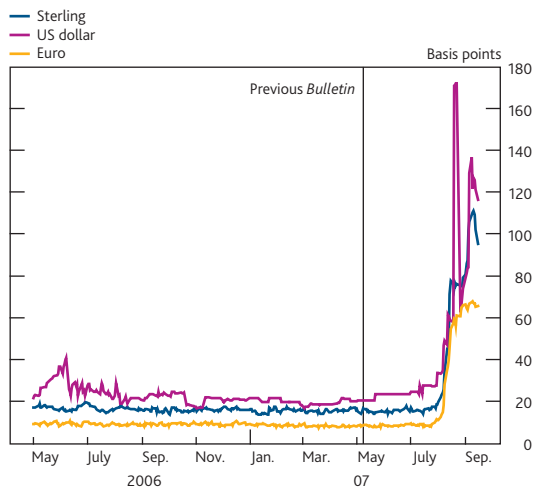


Sources: Bloomberg and British Bankers' Association.

(a) Sterling Libor rates less Bank Rate.

Market contacts reported that money markets became less liquid with maturity, with the number and size of transactions at so-called term maturities (one, three, six and twelve-months) being very curtailed in most major economy currencies. This was particularly pronounced in unsecured interbank interest rates. For example, spreads between these rates, as measured by the daily London interbank offered rate (Libor) and Euro interbank offered rate (Euribor) fixings, and secured rates, rose at term maturities in sterling, euro and dollar markets (Chart 5). Spreads between term Libor rates and estimates of the market's expectations of official policy rates also widened. This was slightly less pronounced in the euro market than in sterling and dollars. As explained in the box on pages 350–351, the widening in these spreads could have reflected liquidity and/or credit concerns.

Chart 5 Spread between three-month unsecured and secured interest rates^(a)



Sources: Bloomberg and British Bankers' Association.

(a) Three-month Libor rate less three-month GC repo rates.

Liquidity also deteriorated in the foreign exchange swap market for term trades and transaction volume fell sharply. The issues in this market were largely the same as those in the money markets. It would have been much more difficult for each bank to manage its liquidity carefully, in each currency, if swap desks' transactions were having the effect of continually changing the currency composition of the bank's overall liquidity position. In consequence, market making in foreign exchange swaps was limited, according to contacts. The pricing of foreign exchange swaps was also made more difficult by the volatility of term money market interest rates.

Futures contracts settling on Libor suggested that implied future sterling interbank rates rose in the first half of the period, fell during the early stages of the increase in financial market volatility in the second half of July, and then rose again in the second half of August as strains in money markets became apparent. A similar pattern was seen in euro and dollar short-term interest rates (Chart 6). Market rates had risen in May and early June, although they subsequently fell back in dollar and euro, reflecting expectations of monetary policy. Sterling rates had continued to rise, in part following the minutes of the June MPC meeting published on 20 June, when market expectations of a rise in Bank Rate at the July MPC meeting had firmed.

The rise in market rates in the second half of August and early September seems to have reflected liquidity positions in money markets rather than upward revisions to market participants' views of the likely path of official rates. That was the view of the Bank's market contacts, and it is supported by the Bank's own estimates of market expectations derived from sterling overnight index average (SONIA) swaps (Chart 7), which suggested that at the end of the review period, Bank

Recent rise in Libor rates

Interest rates that banks charge each other for unsecured borrowing and lending at term maturities, proxied by Libor, have risen sharply across many currencies. This box explains what Libor is and how it is calculated. It also examines possible factors behind higher Libor rates and notes some potential implications.

Calculating Libor

Libor stands for London interbank offered rate. It is the most widely used benchmark for short-term interest rates in major currencies worldwide. It is compiled by the British Bankers' Association (BBA) and is published daily between 11.00 am and 12 noon London time.⁽¹⁾

Libor fixings are published for ten currencies over a range of maturities from overnight to twelve months. The most commonly cited is three-month Libor.

Libor rates are truncated averages of interbank rates submitted by a panel of banks. The panel is selected to reflect the balance of activity in the interbank deposit market. For each currency, panels comprise at least eight contributor banks. Sterling, dollar, euro and yen panels contain 16 banks.

To calculate Libor, contributed rates are ranked in order and only the middle two quartiles averaged arithmetically to get the fixing for that particular currency, maturity and fixing date.

An individual contributor submits the rate at which it could borrow funds, were it to do so by asking for and then accepting interbank offers in 'reasonable market size' just prior to 11.00 am.

Libor is not the only measure of unsecured interbank interest rates. But all measures have risen recently. For example, Euribor, which is a widely used reference rate for the euro interbank market, is typically highly correlated with euro Libor and has remained so through the recent volatility.

Factors that have influenced Libor

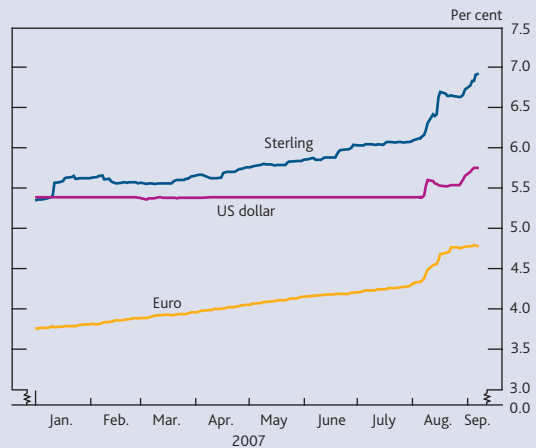
Libor rates reflect:

- current and expected future overnight risk-free interest rates, ie the expected path of monetary policy, as reflected in secured money market rates; and
- a wedge between unsecured and secured interest rates, which may reflect liquidity premia or perceived credit risk.⁽²⁾

Impact of monetary policy expectations

During the review period three-month Libor rose markedly in sterling and euro (**Chart A**). But three-month dollar rates have

Chart A International three-month Libor rates



Source: British Bankers' Association.

been influenced by market participants assigning a higher probability to the FOMC reducing dollar policy rates.

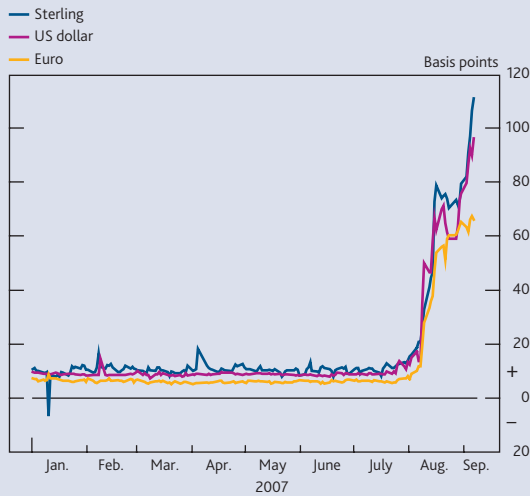
To try and strip out the influence of changes in monetary policy expectations, Libor rates can be compared with interest rates implied by overnight interest rate swap (OIS) agreements. OIS rates should incorporate expectations of future policy rate changes but be less affected by interbank liquidity and credit conditions. That is because the credit risk in overnight transactions is smaller than for equivalent longer maturity deals. Also, OIS are derivative instruments that use margining agreements to reduce counterparty credit risk. Moreover, since there is no exchange of cash at the inception of a swap agreement, they cannot be used for funding purposes.

Between early August and 7 September the spread between three-month Libor and rates implied by three-month OIS widened by around 100 basis points in sterling, 80 basis points in dollar and 60 basis points in euro (**Chart B**) despite a different pattern in increases in three-month Libor levels — over a similar period sterling, dollar and euro Libor rose, respectively, by 85, 35 and 50 basis points. At one-month, sterling and dollar spreads rose by about the same amount (**Chart C**). After controlling for changes in monetary policy expectations, the magnitude of Libor increases have therefore been comparable across currencies. This suggests the factors pushing up Libor have been global and reflect liquidity and/or credit management.

Liquidity

Market contacts have suggested the most important factor has been banks hoarding liquidity. This is because, as described in the main text, many banks had provided committed liquidity lines to specialist financing vehicles, conduits and corporates. Increased uncertainty about if and when these lines may be drawn made banks reluctant to lend

Chart B Spreads of international three-month Libor rates to three-month overnight interest swap rates

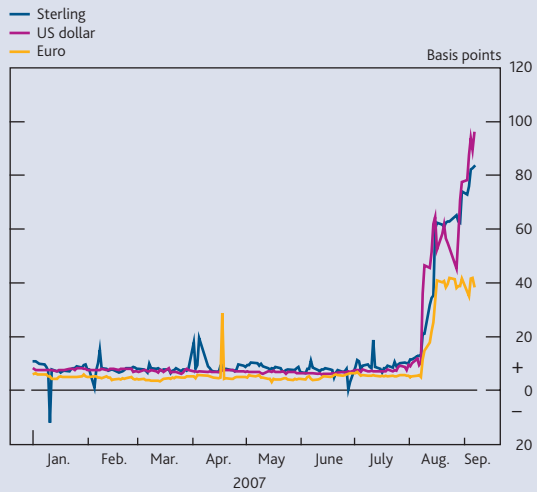


Sources: Bloomberg and British Bankers' Association.

beyond short maturities. Meanwhile, demand for term funds has increased.

Temporary central bank injections of short-term liquidity, aimed at stabilising overnight market interest rates, did not materially narrow the spread between Libor and expected policy rates at term money market maturities.

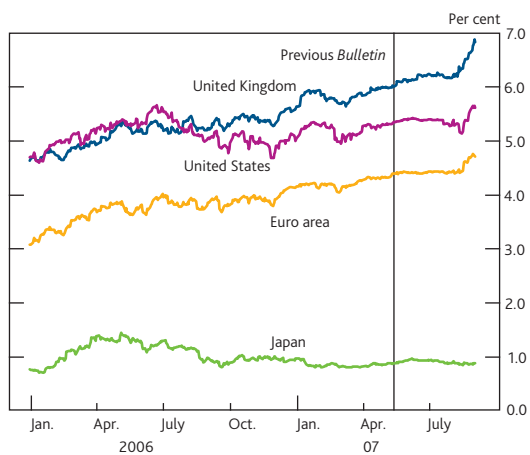
Chart C Spreads of international one-month Libor rates to one-month overnight interest rate swap rates



Sources: Bloomberg and British Bankers' Association.

- (1) For more details see the BBA's website, www.bba.org.uk/bba/jsp/polopoly.jsp?d=141.
- (2) In practice the demand for government bond collateral can also influence the spread between secured and unsecured interest rates. A general shortage of collateral can force those needing it to accept lower interest rates on the cash they lend in exchange for collateral. Such collateral 'squeezes' can widen the secured-unsecured spread. For more detail see the box entitled 'Idiosyncratic volatility in the overnight gilt repo market', *Bank of England Quarterly Bulletin*, 2006 Q3, page 286.

Chart 6 Implied international interest rates from short-term futures contracts^(a)

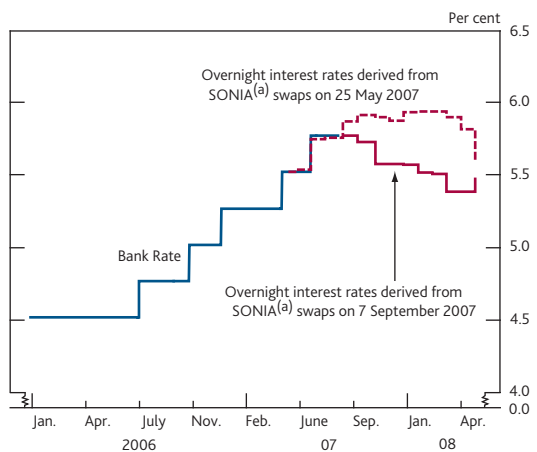


Sources: Bloomberg and Bank calculations.

(a) Uses the futures contract closest to maturity.

Rate was expected to be maintained at 5.75% until the end of the year. This was consistent with survey data: the monthly Reuters survey of UK economists in early August suggested that two thirds of economists surveyed expected Bank Rate to rise to 6.0% by the end of 2007; but by early September, at least two thirds expected it to be maintained at 5.75% (Chart 8).

Chart 7 Bank Rate and forward market interest rates



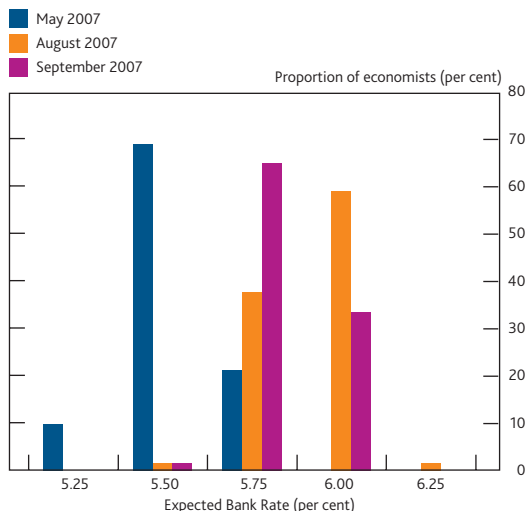
Sources: Bank of England and Reuters.

(a) Sterling overnight index average.

Internationally, market expectations were for the ECB refinancing rate to remain unchanged until at least the end of the year, but for the FOMC to reduce rates by up to 75 basis points to 4.50%.

Uncertainty about short-term interest rates, as measured by implied volatility derived from interest rate options, rose in sterling and other currencies during the market turbulence

Chart 8 Economists' forecasts for Bank Rate at end-2007^(a)

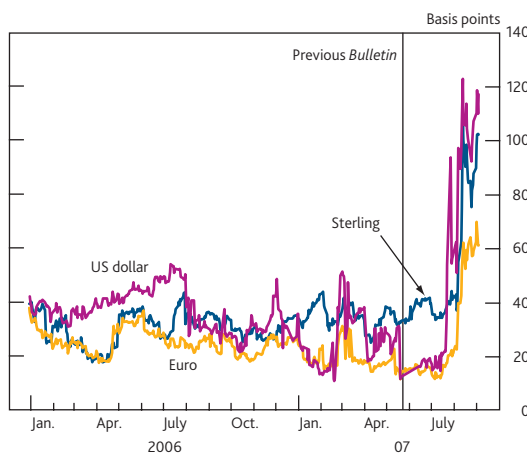


Source: Reuters.

(a) Note that the sample size across surveys can differ. As a result, proportions may change owing to different samples and/or respondents revising forecasts.

from late July (Chart 9). The interest rates on which these options are based are Libor rates, which for the reasons discussed above had risen well outside their usual and largely stable relationship to expected policy rates. It is not possible therefore to infer the extent to which the increase in implied volatility related to increased uncertainty about Libor fixings relative to policy rates, or to uncertainty about policy rates themselves. Chart 10, however, suggests that, while short-term sterling interest rate uncertainty rose, uncertainty about longer-term rates was little changed over the period as a whole.

Chart 9 International three-month implied volatility from interest rate options



Sources: Bank of England and Euronext.liffe.

The sterling effective exchange rate index (ERI) ended the review period little changed. However, within the period it increased by up to 1.7%. This reflected an appreciation against

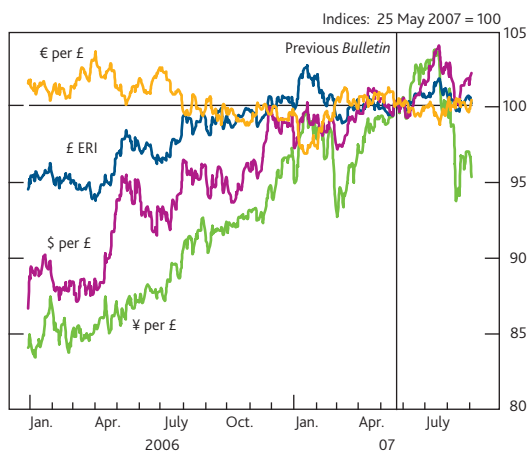
both the dollar and the yen. The dollar/sterling exchange rate reached \$2.06 on 24 July, a 26-year high. On 17 July, the yen/sterling exchange rate reached a 17-year high of ¥250.33. Towards the end of the period, sterling depreciated against the major currencies (Chart 11).

Chart 10 Implied volatility from sterling swaptions



Source: JPMorgan Chase & Co.

Chart 11 Cumulative changes in sterling exchange rates



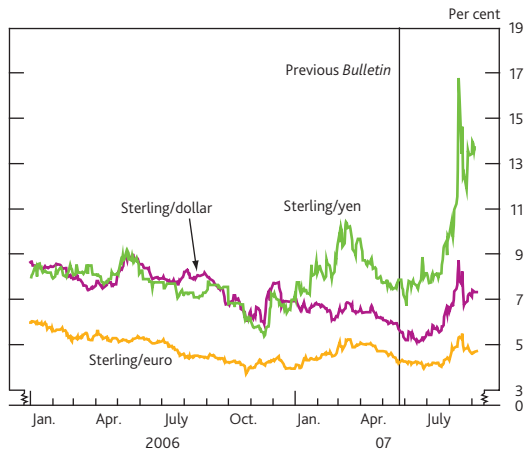
Sources: Bank of England and Bloomberg.

The depreciation later in the period was particularly sharp against the yen, and contacts reported significant unwinding of yen-funded 'carry trade' positions, by speculative and Japanese domestic investors. (In a foreign exchange carry trade, an investor typically borrows in the currency of a country with low interest rates and invests in assets denominated in the currency of another country paying higher rates of interest.)

Given these swings in the exchange rate, short-term realised and implied sterling exchange rate volatility increased for all major currency pairings, particularly against the yen (Chart 12), which briefly caused concern in foreign exchange options markets on 16 August. Looking ahead, futures prices

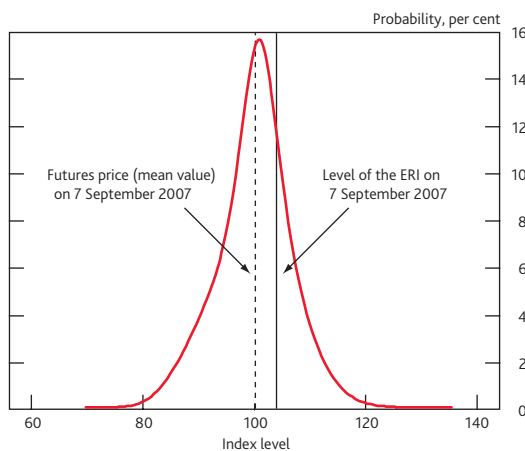
suggested the sterling ERI will depreciate a little over the next two years. And currency option prices indicated that the implied probability distribution of the sterling ERI was roughly symmetric (**Chart 13**).

Chart 12 Three-month implied sterling exchange rate volatility



Sources: Bank of England and Bloomberg.

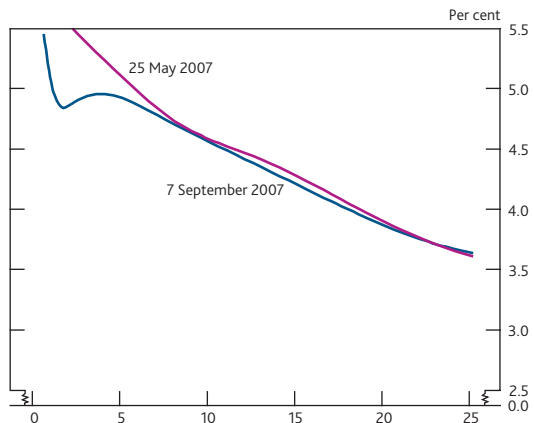
Chart 13 Two-year unconditional sterling ERI probability distribution^(a)



(a) Probability of the sterling ERI being within ± 0.5 index points of any given level. For example, on 7 September 2007 the probability of the ERI being at 100 (between 95.5 and 100.5) in two years' time was around 15%. For details of how this probability distribution is constructed see the box on pages 130–31 of the Summer 2006 *Quarterly Bulletin*.

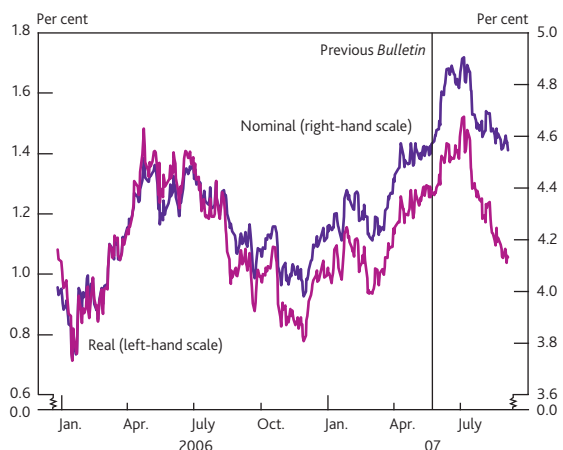
At medium maturities, sterling nominal forward interest rates fell from their May 2007 levels (**Chart 14**). This largely reflected falls in real interest rates on inflation-indexed bonds, and was consistent with market comments about a 'flight to quality' — an increase in demand for safe, liquid assets — in the broader market turmoil (**Chart 15**). Further along the yield curve, nominal forward rates increased slightly over the review period as a whole. At the beginning of the period, sterling forward interest rates had risen broadly in line with dollar and euro rates, reflecting higher real interest rates. However, these rises in nominal and real interest rates were reversed during the later period of market turmoil.

Chart 14 Sterling nominal forward rates^(a)



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

Chart 15 Sterling ten-year nominal and real forward rates^(a)



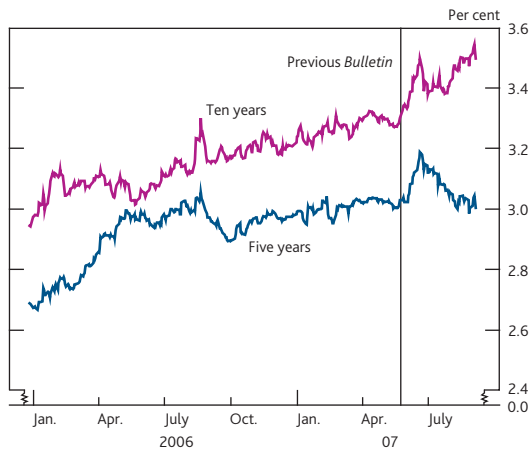
Source: Bank calculations.

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

Shorter-term breakeven inflation rates, derived from the difference between yields on conventional and index-linked gilts, ended the period little changed, but longer-term rates drifted up further to around 3.5% (**Chart 16**). In principle, a rise in breakeven rates either reflects an increase in market participants' expectations of future inflation, or a larger risk premium to compensate investors for uncertainty about inflation. As discussed in previous *Bulletins*⁽¹⁾ it is difficult to distinguish between the influence of these two factors. In practice however, market frictions may distort this picture in the short term. In particular, the rise in recent breakeven rates reflects real interest rates falling by more than equivalent conventional gilt rates. Contacts suggest this might be attributable to the more limited supply of index-linked government bonds.

(1) See Hurd and Relleen (2006), 'New information from inflation swaps and index-linked bonds', *Bank of England Quarterly Bulletin*, Spring, pages 24–34.

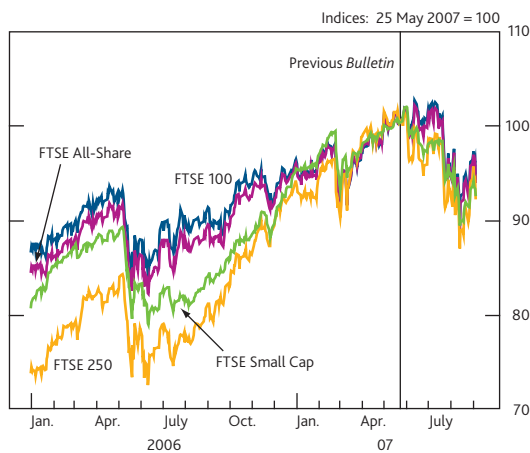
Chart 16 Sterling breakeven inflation forward rates^(a)



(a) Implied instantaneous inflation rates five and ten years ahead, based on the difference between yields on nominal and inflation-linked government bonds. The instruments used are linked to RPI, rather than CPI, and so are not directly comparable to the Bank's inflation target.

UK equity prices fell within the review period, as did equity prices in other major economies. The FTSE All-Share index fell by 6% over the review period as a whole (Chart 17). Most of the fall occurred within a three-week period, between late July and mid-August, at the onset of the broader market turbulence. The falls were consistent with a degree of repricing of assets across financial markets. Market contacts reported that equity price falls were amplified, in part, by speculative investors selling out of equity positions to raise short-term liquidity to meet margin calls against positions in other markets.

Chart 17 Cumulative changes in UK equity indices

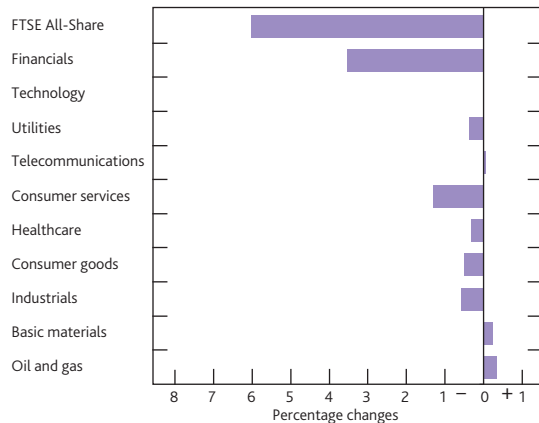


Sources: Bloomberg and Bank calculations.

Towards the end of the period, equity prices recovered some of their earlier falls. There were particularly sharp rises in equity prices internationally following the US Federal Reserve Board's decision to reduce the rate at the Discount Window by 50 basis points, to 5.75%, on 17 August and a statement by the FOMC which said that the downside risks to growth had 'increased appreciably'.

Within index sectors, and consistent with the nature of the strains in financial markets discussed earlier, there were particularly pronounced falls in equity prices of financial companies (Chart 18).

Chart 18 Sectoral contributions to changes in FTSE All-Share index since 25 May 2007^{(a)(b)}

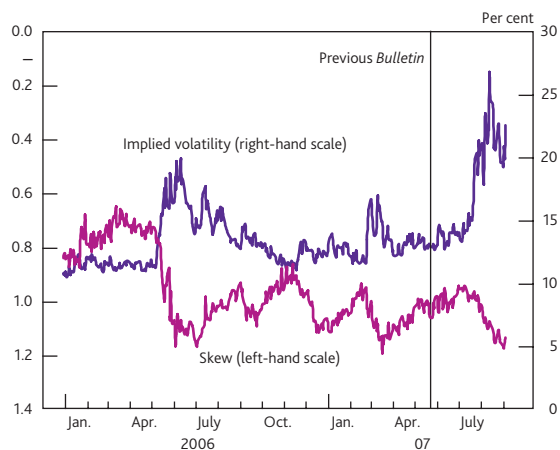


Sources: Thomson Datastream and Bank calculations.

(a) Sector contributions are weighted according to their contribution to market value.
 (b) This chart uses Thomson Datastream indices, rather than the FTSE, in order to make a detailed breakdown possible.

Measures of implied uncertainty about expected future equity prices, derived from options prices, increased sharply (Chart 19). This was consistent with the rise in realised volatility in the period of market turbulence, as markets adjusted to the developments in loan and securitisation markets discussed earlier.

Chart 19 FTSE 100 option-implied volatility and skews^{(a)(b)}



Sources: Bank of England and Euronext.liffe.

(a) Calculated from the distribution of returns from three-month option prices.
 (b) A negatively skewed distribution is one for which large negative deviations from the mean are more likely than large positive deviations.

The strain in loan and securitisation markets was accompanied by a deterioration in wider credit markets, particularly for weaker credits (Chart 20). Liquid, and easily observed,

measures of this are the Crossover indices of credit default swaps on companies with an average rating of BB in Europe and the United States. However, market contacts report that within this latest period of turbulence, the iTraxx crossover index was used as an instrument to hedge (partially) the risk of a wide range of credit positions (ie not just corporate credit risk) hence implied spreads were not necessarily an accurate reflection of the market price of credit risk of the companies referenced in this index. Indeed, the recovery in spreads from their peak on 30 July reportedly reflected speculators selling credit protection, having been attracted by spread levels that were far out of line relative to most estimates of fundamental default probabilities.

Chart 20 Corporate credit default swap spreads

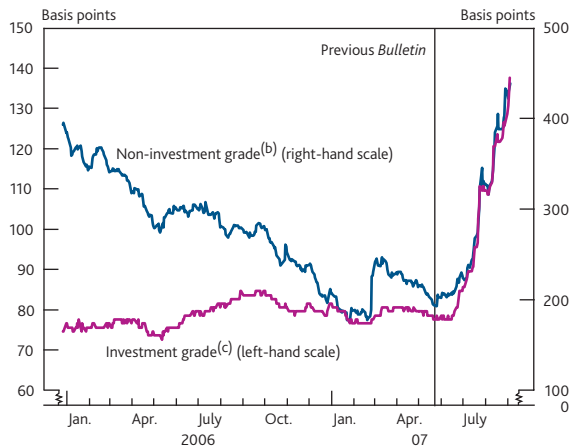


Source: JPMorgan Chase & Co.

- (a) The iTraxx crossover index comprises of credit default swaps on 50 equally weighted European entities with an average rating of BB.
 (b) The CDX crossover index comprises of credit default swaps on 35 equally weighted US entities with an average rating of BB.

Sterling-denominated corporate bond spreads changed little early in the review period, but subsequently non-investment grade spreads widened by 245 basis points and investment grade spreads widened by 60 basis points (Chart 21). This might be attributed to the general repricing of risky assets. However, the sterling high-yield market is much less developed than the corresponding dollar or euro high-yield markets. Non-investment grade and investment grade spreads in dollar markets rose by 228 and 62 basis points, and in euro markets by 242 and 45 basis points, respectively. It is possible that the larger moves in sterling spreads were exacerbated by the sterling index referencing fewer names than the corresponding dollar or euro indices. As discussed later in this *Bulletin*, the Bank's regular Credit Conditions Survey, to be published on 26 September, will be used to give a fuller picture of trends in the demand for, and the supply of, credit, including terms and conditions attached to lending.

Chart 21 Sterling corporate bond spreads^(a)



Source: Merrill Lynch.

- (a) Spreads over Treasuries.
 (b) Aggregate indices of bonds rated lower than BBB3.
 (c) Aggregate indices of bonds rated BBB3 or higher.

Bank of England official operations

The Bank's balance sheet is managed in accordance with its policy purposes. These relate to the implementation of monetary policy; management of the Bank's foreign exchange reserves; provision of banking services to other central banks; provision of payment services for the UK financial system and the wider economy; and management of the Bank's free capital and cash ratio deposits from financial institutions.

Sterling monetary framework

This section reviews the period from 10 May to 13 September — four completed reserves maintenance periods and the first days of a fifth.

The current framework for the Bank's operations in the sterling money markets was introduced in May 2006. The new framework brought about an immediate reduction in the volatility of both secured and unsecured short-term interest rates (Charts 22 and 23). In the early months of 2007 volatility fell further⁽¹⁾ and low volatility continued into the first part of the period now under review.

May–June maintenance period

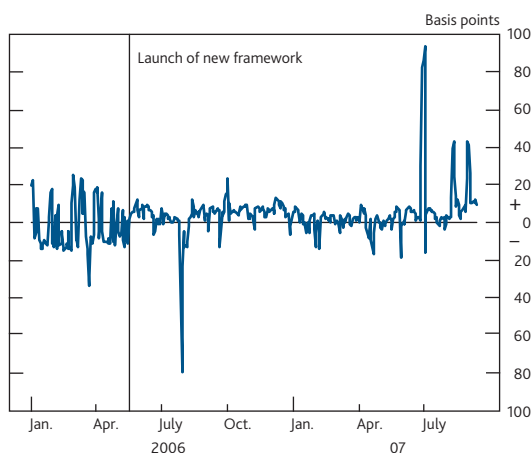
In the maintenance period beginning on 10 May, the secured and unsecured market overnight rates remained close to Bank Rate on average, with very little day-to-day fluctuation. The median spread of SONIA⁽²⁾ to Bank Rate was only 5 basis points, and the average absolute deviation from the median spread (a measure of day-to-day volatility) was only 2 basis points. For the secured rate the equivalent figures were both 4 basis points. These statistics are reflected in Charts 22

(1) See pages 202–03 of the 2007 Q2 *Bulletin*.

(2) The sterling overnight index average (SONIA) is the daily trade-weighted average interest rate from unsecured overnight sterling transactions brokered in London.

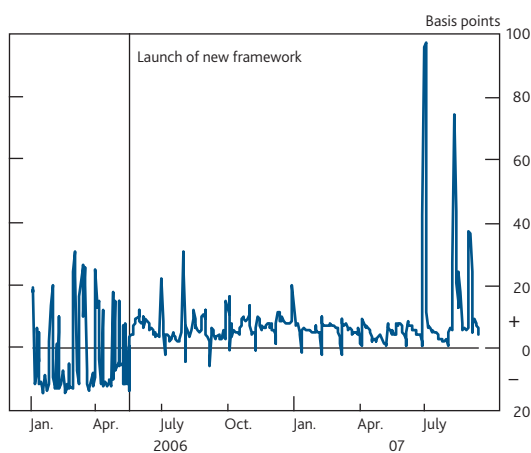
and 23 on the spreads between these rates and Bank Rate. The peaks of the distributions were close to the zero point on the horizontal axis — meaning that on average the spreads were close to zero. And the distributions were very narrow, meaning that there was little variation in the spread from day to day.

Chart 22 Spread to Bank Rate of secured market interest rate



Sources: ICAP and Bank calculations.

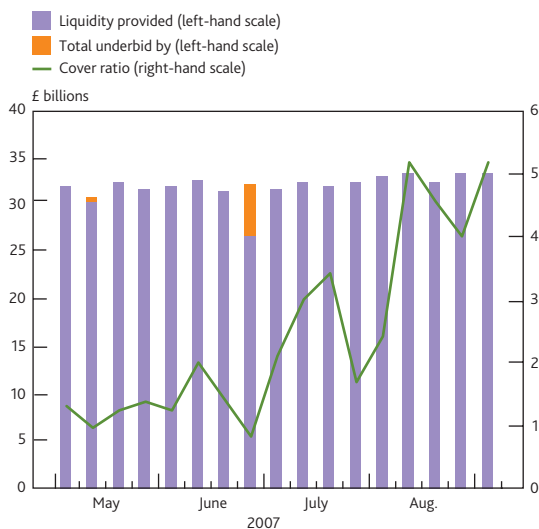
Chart 23 Spread to Bank Rate of unsecured sterling overnight interest rate



Sources: Wholesale Market Brokers' Association and Bank calculations.

This stability in rates was not disturbed by the fact that the second weekly open market operation (OMO) of the period, on 17 May, was not completely subscribed, the first time that that had happened since the launch of the new framework.⁽¹⁾ As **Chart 24** shows the amount of funds offered but not taken was relatively small (£609 million). The framework provides that 'in the event of underbidding, any funds not allocated are taken into account in the subsequent scheduled OMOs within the maintenance period' (paragraph 103 of the 'Red Book').⁽²⁾ That was done, and the uncovered operation had little effect on market rates.

Chart 24 Liquidity provided in weekly operations and cover ratio



June–August maintenance periods

For the first three weeks of the four-week maintenance period beginning on 7 June the pattern of stable rates continued. But then on 28 June, the final OMO of the maintenance period was underbid by a significant amount, and overnight rates rose sharply.

Before the operation on 28 June, overnight market rates, although close to Bank Rate (then 5.5%), had been drifting down. On the morning of 28 June, ahead of the tender at 10.00 am, overnight secured money (general collateral gilt repo) had been trading at 5.55%. Perhaps because the Bank's counterparties expected market rates to fall further, the tender was underbid by £5.4 billion. After the result was announced, the overnight GC repo rate rose to 5.62% by 10.30 am and had reached 6.75% by 1.30 pm.

The shortfall of £5.4 billion was significant in relation to the aggregate reserves target of £16.4 billion. But the Bank regularly undertakes a fine-tuning OMO on the final day of each maintenance period, to bring average reserves into line with aggregate targets. In this case, funds offered in the fine tune scheduled for 4 July would take into account the amount offered but not allocated on 28 June. In itself, the undersupply in the one-week OMO on 28 June meant that reserves balances would be lower than intended for seven days. If that had all had to be made good in the overnight fine-tuning OMO, seven times the shortfall would have had to have been offered (£37.8 billion), to offset in one day the shortfall over seven days. But in the event, high market rates induced use of the Bank's standing lending facility over three days, adding reserves to the system. This meant that less needed to be offered in the fine tune (£24.4 billion).

(1) See also page 204 of the 2007 Q2 *Bulletin*.

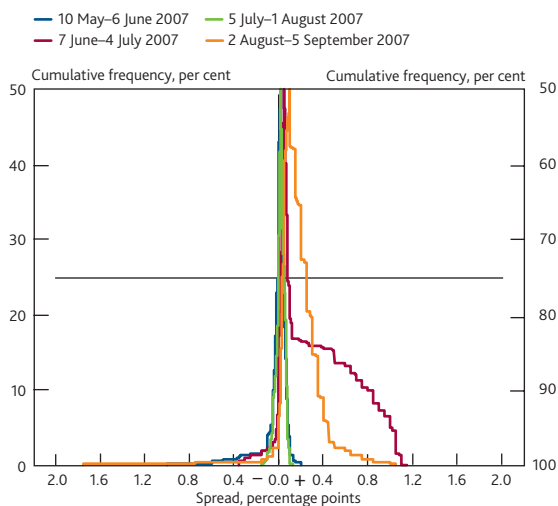
(2) *The Framework for the Bank of England's Operations in the Sterling Money Markets*, www.bankofengland.co.uk/markets/money/index.htm.

Aggregate daily use of the standing facilities was published, as usual, on the following day. And the amount of funds forecast to be offered in the fine-tuning OMO was published, as usual, on each day of the final week of the maintenance period, starting on 29 June. In this way, counterparties were informed of the scale of the supply of funds in the standing lending facility and the prospective supply of funds in the OMO on the final day. That fine-tuning OMO was oversubscribed (£32.6 billion was bid for) and aggregate reserves ended up very close to target, averaged over the maintenance period as a whole.

As is normal, the fine-tuning operation on the final day of the maintenance period was undertaken at Bank Rate, and funds were available on that day in the standing lending facility at 25 basis points above Bank Rate compared with 100 basis points earlier in the maintenance period. But despite the prospect of funds being available from the Bank at these rates on the final day, market overnight rates on the Friday, Monday and Tuesday of the final week of the maintenance period were close to the rate charged in the Bank's standing lending facility on those days (100 basis points above Bank Rate). Trade-weighted daily average rates, both secured and unsecured, were just below the standing facility rate, but some individual trades were above it. But after the fine-tuning operation had been conducted on Wednesday, market rates returned close to Bank Rate.

The impact of high market rates, in the final week, on the outturn for the June–July maintenance period as a whole can be seen in **Charts 25** and **26**. In both the secured and unsecured markets, three quarters or more of the volume of trades in the maintenance period were undertaken at rates

Chart 25 Folded cumulative distribution^(a) of spread of sterling secured overnight interest rate (trade weighted) to Bank Rate

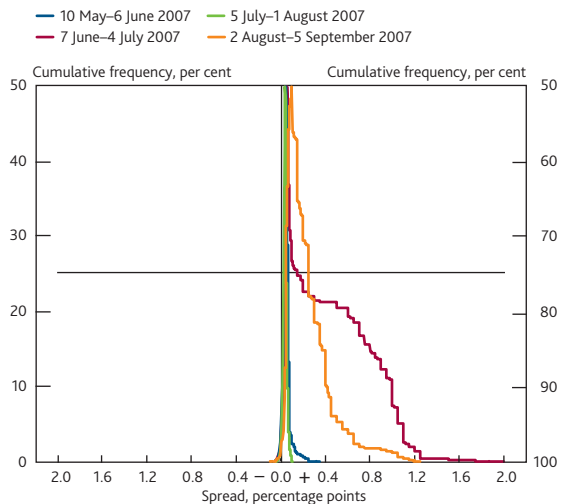


Sources: BrokerTec and Bank calculations.

(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.

close to Bank Rate. But in both charts there is a long tail to the right of the distribution, containing trades undertaken at higher rates. In both cases the tail extends to more than 1 percentage point above Bank Rate (as shown on the horizontal axis). That reflects trades undertaken at rates above the maximum standing lending facility rate.

Chart 26 Folded cumulative distribution^(a) of spread of sterling unsecured overnight interest rate (trade weighted) to Bank Rate



Sources: Wholesale Market Brokers' Association and Bank calculations.

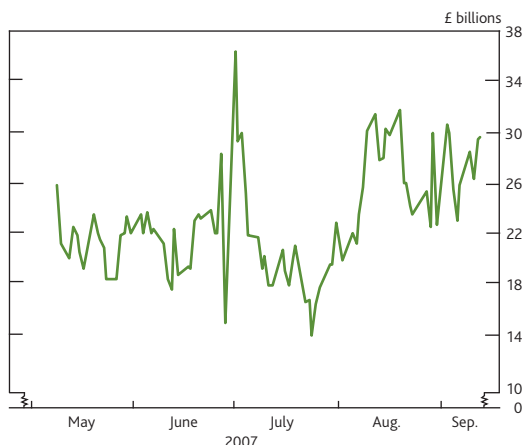
(a) Distribution of the spread between overnight interest rate at end-of-day and the official interest rate. The distributions are folded at the median so that cumulative probabilities for values above (below) the median are indicated by the right-hand (left-hand) scale.

Market rates, having come back into line with Bank Rate on the final day of the June–July maintenance period, remained there throughout the July–August period. The median spread from Bank Rate was only 2 basis points for the secured overnight rate and 4 basis points for the unsecured rate. The measures of volatility were also very low at 3 and 2 basis points respectively. The distributions of spreads to Bank Rate in the July–August maintenance period plotted in **Charts 25** and **26** are accordingly narrow and close to zero.

August–September maintenance period

Early in the August–September reserves maintenance period, sterling money markets were struck by the widespread increase in demand for liquidity described earlier (see page 349 of this *Bulletin*). At the very short end of the market, trading volumes were particularly vigorous (**Chart 27**). But with banks keen to conserve liquidity against the possible need to deploy the funds in other markets, the balance of supply and demand shifted and market interest rates rose sharply. By 10 August the spread of the daily (trade-weighted) average secured overnight rate above Bank Rate had reached 40 basis points, and that of the unsecured rate had reached 75 basis points (**Charts 22** and **23**).

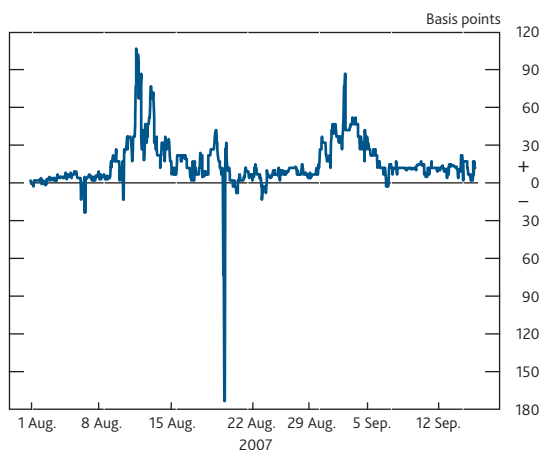
Chart 27 Volume of brokered business in the sterling overnight unsecured market



Source: Wholesale Market Brokers' Association.

These peaks in rates were short-lived. In the following two weeks, market rates fell towards Bank Rate, although generally remained further above it than usual. But at the end of calendar August, liquidity pressures returned and the spreads of the secured overnight rate to Bank Rate widened again, particularly intraday (Chart 28). According to market contacts a number of factors contributed to this. One was an unusually strong desire of some banks and securities dealers to show high liquidity in their published balance sheets, given heightened uncertainty in many markets. The US Labor Day holiday on 3 September curtailed banks' ability to manage liquidity by using foreign exchange swap markets. And some contacts suggested that a perception that wider market problems would persist for longer than had previously been thought also added to the demand for liquidity. In the event, market rates did fall back in the early days of September but again remained further above Bank Rate than normal, and in the case of the secured rate, further above than before the month-end.

Chart 28 Spread to Bank Rate of intraday secured sterling overnight interest rate



Sources: BrokerTec and Bank calculations.

As Charts 25 and 26 show, market rates were more often away from Bank Rate in the August–September maintenance period than they had been in June–July. But there were fewer cases of extreme deviation. The Bank's standing facilities were used in the August–September period, but on fewer occasions and for lower amounts than in June–July (Table A).⁽¹⁾

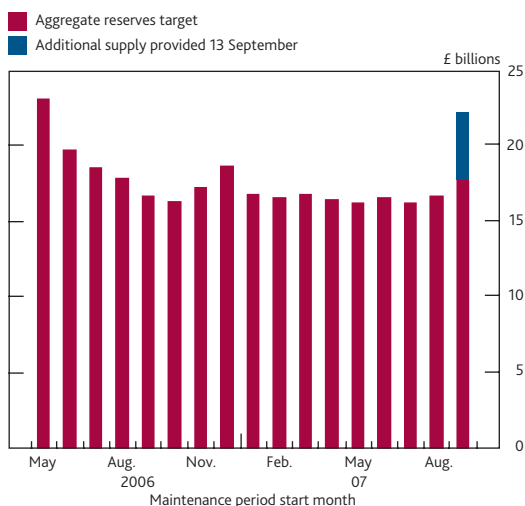
Table A Use of standing facilities

Average amounts outstanding in £ millions		
Maintenance periods 2007	Lending facility	Deposit facility
10 May–6 June	47	–
7 June–4 July	496	13
5 July–1 August	4	–
2 August–5 September	53	43

September–October maintenance period

Each month, ahead of the start of a reserves maintenance period, reserves banks in the United Kingdom have the opportunity to set new reserves targets, and the Bank undertakes to supply in its open market operations the reserves that banks in aggregate need to meet those targets. Thus the monthly resetting of reserves targets provides an opportunity for banks individually, and the banking system as a whole, to obtain extra liquidity from the Bank. It was not surprising therefore that for the reserves maintenance period starting on 6 September reserves banks in aggregate increased their targets: by 6% from £16,560 million to £17,630 million (Chart 29).

Chart 29 Aggregate reserves targets



There was, however, reason to believe that this increase did not fully reflect banks' demand for reserves. The Bank pays Bank Rate on reserves holdings (within a range around each

(1) And Table D2.2.1 in *Monetary and Financial Statistics (BankStats)*, www.bankofengland.co.uk/statistics/ms/2007.htm.

bank's target) and supplies reserves in its OMOs at Bank Rate. But if an OMO tender is oversubscribed, bids from individual counterparties are scaled back. Reserves banks that are OMO counterparties cannot therefore be sure of obtaining the reserves they need directly from the Bank in the OMOs. And some reserves banks are not OMO counterparties and so necessarily have to obtain the funds they need in the market. Many banks therefore compare Bank Rate paid on reserves with a market rate, as the marginal rate for funding reserves. The cost of that interest rate spread is to be compared with the benefits provided by reserves as a buffer for absorbing shocks to banks' payment flows. With market rates high and payments uncertainty increased, both costs and benefits will have increased during the August–September maintenance period.

Reserves targets for the September–October maintenance period needed to be set on the basis of *expected* costs and benefits, and here a co-ordination problem seemed possible. If banks collectively set higher reserves targets and the Bank supplied the extra liquidity, pressures in the money market might be expected to ease, and market rates, and the cost of holding reserves, might be expected to fall. But individual banks setting reserves targets would not know what targets other banks would set. And the incentive for any individual bank to set a higher target was diluted to the extent that the benefit of its action would go partly to other banks in the form of lower funding costs.

The Bank could not know whether or to what extent such a co-ordination problem had affected targets set for the September–October maintenance period, but it took the possibility seriously. When it announced the new aggregate target on 5 September it stated that in its OMO on the following day it would offer to supply reserves to meet the new target, following standard practice. But if over the subsequent week the secured overnight rate continued to exceed Bank Rate by an unusual amount it would in the following OMO, on 13 September, offer to supply, at Bank Rate, additional reserves of up to 25% of the aggregate reserves target. If they were supplied, the Bank would accommodate the extra reserves by widening the range around banks' reserves targets within which reserves are remunerated at Bank Rate. Widening the range around banks' reserves targets and/or supplying additional reserves are contingencies set out in the 'Red Book'; a summary of these contingencies is shown in the box opposite.

In the event, the secured overnight rate did fall back in the subsequent week, but it was still unusually high relative to Bank Rate. The Bank accordingly offered in the OMO of 13 September extra reserves equivalent to 25% of the aggregate target. The OMO was oversubscribed and the additional reserves were all supplied (**Chart 29**). Later that day the secured and unsecured overnight rates fell further and

Contingency planning in the 'Red Book'

The *Framework for the Bank of England's Operations in the Sterling Money Markets*⁽¹⁾ (the 'Red Book') contains a number of provisions that can be used in stressed or otherwise extraordinary conditions. Those most relevant to the recent period describe ways in which each of the three main elements of the framework can be operated if there is 'major operational or financial disruption'.

- *The Bank can raise the ceilings on the reserves targets which reserves banks are allowed to set.*
Red Book paragraph 92
- *It can carry out exceptional fine-tuning OMOs if circumstances are such that this is needed to ensure a smooth pattern of reserves supply.*
Red Book paragraph 112
- *In the event of major disruption during a maintenance period it can increase the supply of central bank money through regular or exceptional OMOs. They can be for a fixed amount determined by the Bank or an offer of funds on demand.*
Red Book paragraphs 93, 113
- *If it increases the supply of central bank money, it can raise reserves targets and/or widen the range around them, to accommodate the extra supply.*
Red Book paragraphs 93, 113
- *It can also widen the range around reserves targets even if it does not supply extra central bank money via OMOs.*
Red Book paragraph 94
- *If it increases the supply of central bank money via OMOs it can narrow the spread between the standing lending and deposit facility around Bank Rate, including to zero.*
Red Book paragraph 113
- *It can also narrow the spread between the standing lending and deposit facility around Bank Rate, including to zero.*
Red Book paragraph 129
- *It can extend its list of eligible collateral in exceptional circumstances, including major operational or financial disruption, for example to include US Treasury bonds.*
Red Book paragraph 137

(1) www.bankofengland.co.uk/markets/money/publications/redbookfeb07.pdf

traded close to Bank Rate. The Bank will continue to monitor the position.

Because banks' targets had not changed, reserves ranges around those targets needed to be enlarged to accommodate the increased supply. Additional reserves equivalent to 25% of aggregate targets had been supplied and the Bank would offer to roll over the extra supply in the remaining weekly OMOs of the maintenance period. If an extra 25% were supplied for three weeks in a four-week maintenance period, on average over the maintenance period as a whole, reserves would be 18¾% above target. Reserves ranges were widened to plus or minus twice that amount ($\pm 37\frac{1}{2}\%$) to allow flexibility in the distribution of the additional reserves between banks. Some banks might wish to hold reserves up to the top of the new range. Other banks might wish to hold reserves at their target. A range of $\pm 37\frac{1}{2}\%$ provided room for banks to make these different choices.

In the period under review the Bank continued to undertake longer-term repo operations against eligible collateral at four different maturities (Table B). These operations were all fully

Table B Long-term repo operations

	Three-month	Six-month	Nine-month	Twelve-month
15 May 2007				
On offer (£ millions)	1,500	750	400	150
Cover	1.79	2.04	2.81	3.62
Weighted average rate ^(a)	5.605	5.697	5.780	5.840
Highest accepted rate ^(a)	5.630	5.710	5.780	5.840
Lowest accepted rate ^(a)	5.580	5.695	5.780	5.840
Tail ^(b) basis points	0.2	0	0	0
19 June 2007				
On offer (£ millions)	1,500	750	400	150
Cover	2.03	1.32	1.87	2.95
Weighted average rate ^(a)	5.691	5.842	5.965	6.060
Highest accepted rate ^(a)	5.705	5.845	5.965	6.060
Lowest accepted rate ^(a)	5.680	5.830	5.965	6.060
Tail ^(b) basis points	0.01	0	0	0
17 July 2007				
On offer (£ millions)	1,600	750	400	200
Cover	2.64	1.68	1.5	2.00
Weighted average rate ^(a)	5.883	6.023	6.140	6.225
Highest accepted rate ^(a)	5.890	6.025	6.140	6.225
Lowest accepted rate ^(a)	5.875	6.015	6.140	6.225
Tail ^(b) basis points	0.01	0.01	0	0
14 August 2007				
On offer (£ millions)	1,500	750	400	200
Cover	2.27	1.05	1.13	1.25
Weighted average rate ^(a)	5.907	5.932	5.985	6.010
Highest accepted rate ^(a)	5.930	5.950	5.985	6.010
Lowest accepted rate ^(a)	5.900	5.800	5.985	6.010
Tail ^(b) basis points	0.01	0.13	0	0

(a) Per cent.

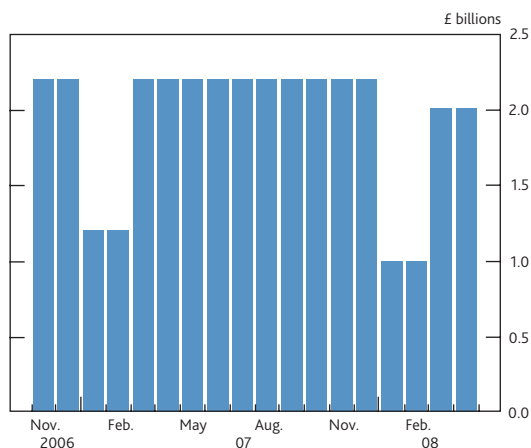
(b) The yield tail measures the difference between the weighted average accepted rate and the lowest accepted rate.

covered. The cover ratios were not unusually high in the tender held on 14 August.

Foreign currency reserves

There have been no significant developments in the Bank's holdings of foreign exchange reserves over the review period. The assets held in the reserves are currently funded by two liabilities: a euro-denominated note which matures on 28 January 2008 and the new programme of annual bond issuance which commenced in March 2007. As shown in Chart 30, upon maturity of the 2008 Note, the level of reserves will drop back from the current level of just over £2 billion to around £1 billion until the subsequent bond issue, due in March 2008, is planned to take the level back up to £2 billion. At present, the steady state of the Bank's foreign exchange reserves is planned to be around £3 billion.

Chart 30 Planned evolution of the Bank's foreign exchange reserves



Capital portfolio

The Bank holds an investment portfolio that is approximately the same size as the Bank's capital and reserves (net of equity holdings, eg in the Bank for International Settlements (BIS) and European Central Bank (ECB), and the Bank's physical assets) together with aggregate cash ratio deposits. The Bank's 'free' capital and cash ratio deposits are invested in a portfolio of sterling-denominated securities and short-term repos. Securities purchased by the Bank for this portfolio are normally held to maturity.

Purchases are generally made each month with purchase details announced in advance on the Bank's wire service pages. Gilt purchases of £20 million each were made in June, July and August.

Balance sheet

As already described, reserves banks chose higher targets for the September–October reserve maintenance period and the Bank supplied extra reserves in its open market operation on

13 September. The Bank's balance sheet was thus expanded towards the very end of the period under review. **Table C** shows the size and composition of the balance sheet on the final days of the maintenance periods ended in early May and early September. Between those dates the balance sheet was not much changed. There was a modest increase in the note issue. In aggregate reserves banks hardly changed their

reserves targets over this period (**Chart 29**). The increase in their actual reserve holdings between the two dates shown in **Table C** simply reflects the pattern of reserves supply — a modest use of the standing lending facility on 9 May and a somewhat larger supply by way of a fine-tuning open market operation of £2.3 billion on 5 September (included in 'short-term sterling reverse repo' in **Table C**).

Table C Simplified version of Bank of England consolidated balance sheet^{(a)(b)}

£ billions					
Liabilities	5 Sep.	9 May	Assets	5 Sep.	9 May
Bank note issue	41	40	Short-term sterling reverse repo	36	31
Reserves account balances	21	18	Long-term sterling reverse repo	15	15
Standing facility deposits	0	0	Ways and Means advance	13	13
Other sterling deposits, cash ratio deposits and the Bank of England's capital and reserves	10	11	Standing facility assets	0	1
Foreign currency denominated liabilities	12	11	Other sterling-denominated assets	4	4
			Foreign currency denominated assets	16	16
Total^(c)	84	80	Total^(c)	84	80

(a) The Bank Charter Act 1844 requires the Bank of England to separate the note issue function from its other activities. Accordingly, the Bank has two balance sheets: for 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 2006 *Annual Report*, pages 36–37.

(c) Figures may not sum to totals due to rounding.