# **Markets and operations**

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

- Sterling short-term market interest rates fell, as market participants appeared to revise downwards their views on the likely future path of monetary policy. Short-term euro rates also fell slightly whereas US dollar rates were little changed. Nominal forward rates at longer maturities declined across the major currencies.
- Global equity prices rose, despite market concerns about the economic impact of higher oil prices, which may have reflected a decline in real interest rates, robust profit growth, and perhaps lower risk premia.
- Credit spreads narrowed, which also suggested investors' appetite to take risk remained strong. Many manifestations of the recent 'search for yield' appeared to remain intact.
- In July, the Bank published the draft legal and operational documentation for its reformed sterling money market operations. And in August the Bank published a consultative paper describing proposals for managing the transition to the new arrangements.

The world economy continued to grow robustly despite market concerns about further increases in oil prices. Reflecting this, global equity prices continued to rise. Movements in interest rates nonetheless suggested some variation in the cyclical position of individual economies (Table A).

In the United Kingdom, the official sterling interest rate was reduced by 25 basis points during the period, having remained unchanged for the previous twelve months. The expected path of future sterling interest rates was revised down, in part reflecting downward revisions to expectations of GDP growth (Chart 1). UK financial markets were not seriously disrupted by the bombings in London in July.

Policy rates in other major economies were unchanged or, in the case of the United States, raised in line with market expectations.

Against this backdrop, longer-term forward interest rates declined across major currencies in both nominal and real terms, and remained at low levels by historical standards. Yields on assets exposed to credit risk also

# Table A Summary of changes in market prices

	27 May	2 Sep.	Change		
June 2006 three-month interbank interest rates (per cent)					
United Kingdom	4.50	4.25	-25 bp		
Euro area United States	2.29 4.07	$2.15 \\ 4.06$	-15 bp -1 bp		
United States	4.0/	4.00	-1 <i>bp</i>		
Ten-year nominal forward rates (per cent) <sup>(a)</sup>					
United Kingdom	4.46	4.20	-26 bp		
Euro area	4.32	3.99	-33 bp		
United States	4.89	4.70	-20 bp		
Equity indices (domestic currency)					
FTSE 100	4986	5327	6.8%		
Euro Stoxx 50	3084	3274	6.2%		
S&P 500	1199	1218	1.6%		
Exchange rates					
Sterling effective exchange rate	100.2	101.0	0.8%		
\$/€ exchange rate	1.255	1.255	0.0%		
Investment and a conditionade (hasis points)					
Investment-grade credit spreads (basis points) Sterling-denominated	82	73	-9 bp		
Euro-denominated	56	45	-11 bp		
US dollar-denominated	105	89	-16 bp		
<b>Commodity prices</b> (US dollars) Brent crude oil	49.65	65.57	32.1%		

Columns may not correspond exactly due to rounding.

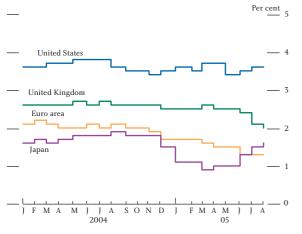
Sources: Bank of England, Bloomberg and Merrill Lynch.

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

declined and credit spreads narrowed, reversing some of the widening that had accompanied a period of stress at the beginning of May. More generally, the May credit

(1) The period under review is 27 May (the data cut-off for the previous Quarterly Bulletin) to 2 September.

# Chart 1 Expected real GDP growth for 2005



Source: Consensus Economics.

disturbance, which had been triggered by ratings downgrades of GM and Ford, does not appear to have had a sustained impact on financial markets despite some initial spillovers into other markets. In particular, fears of large-scale redemptions of investments in hedge funds at the end of June, which might have prompted liquidations of hedge fund positions in credit and other markets, appear not to have been borne out.

Indeed, neither the May credit market disturbance, nor the continued withdrawal of monetary accommodation in the United States, appear to have dented investors' risk appetite. Most of the manifestations of the recent 'search for yield' have remained intact. If compressed risk premia across asset prices reflected a degree of over-valuation, adjustment did not seem to have occurred during the review period. In this respect, potential risks to stability posed by any potential adjustment, as highlighted in recent issues of the Bank's *Financial Stability Review*, remain.

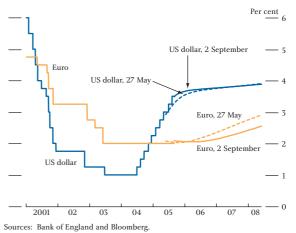
# Short-term interest rates

Movements in short-term interest rates appeared to reflect differing cyclical positions across major international economies. As had been widely anticipated, US dollar official rates were increased by 50 basis points over the period, continuing the gradual withdrawal of monetary accommodation in the United States. Euro and yen official rates were unchanged; but the United Kingdom's Monetary Policy Committee (MPC) voted to reduce sterling official rates by 25 basis points, the first reduction since mid-2003.

Market participants' views on the likely path of future monetary policy reflected different near-term outlooks across countries. In the United States, data releases suggesting US economic growth remained robust initially contributed to a slight rise in the path of expected future interest rates through July (Chart 2). Towards the end of the period, however, US dollar implied rates fell sharply, reflecting concerns immediately after Hurricane Katrina about the economic impact of the associated increases in oil prices (Chart 3). By the end of the period, market prices were broadly consistent with two further 25 basis point increases in US dollar official rates by end-2006. Euro short-term forward rates fell slightly over the period, and remained consistent with expectations that official euro rates would remain on hold for the rest of the year.

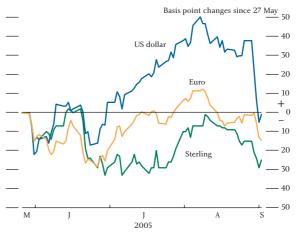
Sterling interest rates implied by futures contracts expiring in June 2006 fell by around 25 basis points (Chart 3). The decline in the first half of the review period was apparently triggered by the *Minutes* of the

## Chart 2 Short-term official interest rates and nominal forward rates<sup>(a)</sup>



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

### Chart 3 Cumulative changes in June 2006 interest rate futures contracts

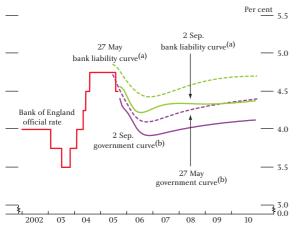


Sources: Bloomberg and Euronext.liffe.

June MPC meeting, which revealed that two MPC members had voted to reduce rates, and was reinforced by data showing downward revisions to UK GDP figures. Implied sterling rates rose slightly during early August but subsequently fell back, in part reflecting the immediate concerns about the fallout from the hurricane in the United States.

By 2 September, the sterling forward curve implied market expectations of at least one further 25 basis point reduction in official rates in the final quarter of 2005 or early 2006 (Chart 4). Chart 4 shows the path of one-day interest rates implied by market prices. In the past, the Bank has often used two-week forward rates as a guide to future short-term interest rates. But the Bank is seeking to control money market rates right up to the next MPC decision.<sup>(1)</sup> These rates always include the overnight rate. So, strictly, forward overnight rates are a cleaner measure of expectations of official rates. This technical change, which is unlikely to have any material effect on the level or shape of the forward curve derived, is explained further in the box on page 304.





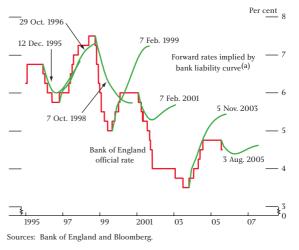
Sources: Bank of England and Bloomberg

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

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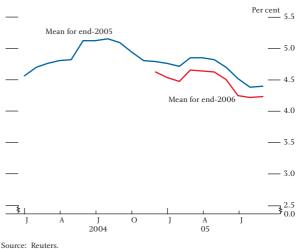
The rate reduction in August followed a number of increases over the previous two years. Compared with the recent past, it is slightly unusual for the forward curve to be so flat following a change in the direction of official rates (Chart 5). But survey data suggested that this was consistent with economists' forecasts that any further near-term reduction in the official rate was expected to be modest. According to the September

### Chart 5 Bank of England official rate and nominal forward interest rates



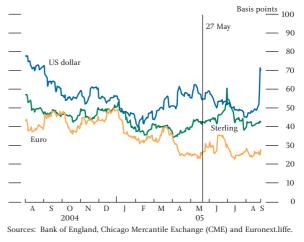
(a) Instantaneous forward rates implied by a curve fitted to a combination of instruments that settle on Libor.

### Chart 6 Economists' forecasts for the Bank of England official rate



# Chart 7

# Six-month implied volatility from interest rate options



(1) For more details, see 'Reform of the Bank of England's Operations in the Sterling Money Markets', available at www.bankofengland.co.uk/markets/money/smmreform050404.pdf.

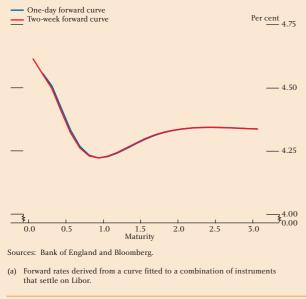
# A change in the presentation of market forward interest rates

When presenting market expectations of official sterling interest rates, the Bank has in the past used two-week forward rates, reflecting the fact that it lends to the banking system at a maturity of around two weeks in its current open market operations.

As part of the review of its operations in the sterling money markets, the Bank announced last year that the primary objective of its operations would be to reduce volatility in overnight rates, establishing a flat money market yield curve, consistent with the official policy rate, out to the next MPC decision date.<sup>(1)</sup> This implies that overnight market interest rates should be in line with the official interest rate until the next MPC meeting. Consistent with this objective, the Bank has decided to use one-day forward rates to

#### **Chart A**

# One-day and two-week forward curves on 2 September 2005<sup>(a)</sup>

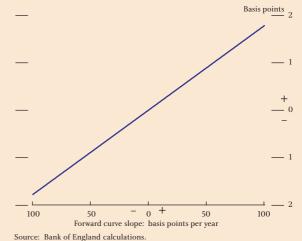


represent market expectations of the policy rate from now on.

This change will have limited practical significance, as one-day forward rates are typically very close to two-week forward rates at maturities beyond the very short term. For example, Chart A shows the one-day and two-week forward curves on 2 September 2005; the two curves are almost indistinguishable. Chart B shows how the difference between one-day and two-week forward rates depends on the slope of the yield curve. If the forward curve is perfectly flat, the two rates will be identical. Even in the presence of a very steep forward curve, the difference would be no more than a few basis points.

#### **Chart B**

Difference between two-week rate and one-day rate for given slope of forward curve<sup>(a)</sup>



oureer built of England calculations.

(a) Two-week less one-day forward rates for a given slope of a linear forward curve. For example, if the yield curve is linear, and the one year ahead one-day forward rate exceeds the current one-day rate by 100 basis points, then the current two-week rate will be around two basis points higher than the current one-day rate.

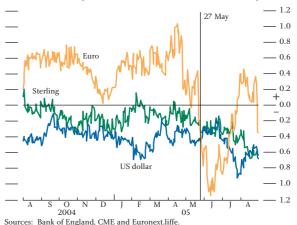
 See 'Reform of the Bank of England's Operations in the Sterling Money Markets, a second consultative paper', available at www.bankofengland.co.uk/markets/money/smmreform041125.pdf.

survey conducted by Reuters, the mean of economists' expectations for the official rate at the end of 2005 was 4.40%; for end-2006, the mean expectation was 4.23% (Chart 6). These figures were around 30 basis points lower than at the time of the previous *Bulletin*.

Measures of uncertainty about sterling interest rates, derived from options prices, were broadly unchanged over the period as a whole (Chart 7). But, in the run-up to the July MPC meeting, speculation about future interest rates contributed to a rise in implied volatility. This move was temporarily reinforced by the bombings in London on 7 July, which triggered a short-lived spike up in sterling interest rate uncertainty. Implied volatility

# Chart 8

#### Six-month implied skew from interest rate options



of short-term US dollar interest rates rose sharply towards the end of the period, reflecting uncertainty about the effects of Hurricane Katrina. But longer-term measures of uncertainty, implied by US dollar swaptions prices, changed little over the period, suggesting that the rise in near-term uncertainty was not expected to be sustained.

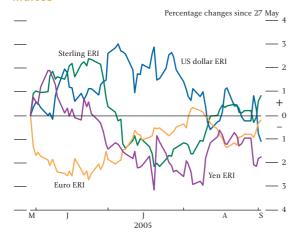
The balance of risks, implied by options prices, to both sterling and US dollar interest rates moved further to the downside over the period. Risks to euro-area rates initially moved sharply to the downside following the rejection of the EU constitution by voters in France and the Netherlands, but ended the period broadly unchanged (Chart 8).

# Foreign exchange markets

Over the period, exchange rate movements were difficult to reconcile with changes in relative interest rates. The sterling exchange rate index (ERI) rose by 0.8% having been, at one point in July, more than 2% lower than its level at the time of the previous *Bulletin* (Chart 9). Other major ERIs fell over the period; the largest declines were in the yen ERI, which fell 1.8%, and the US dollar ERI, which ended the period 1.1% lower.

#### Chart 9

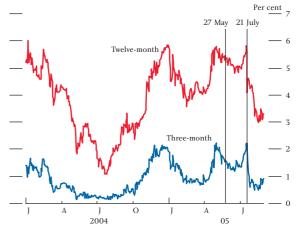
#### Cumulative changes in effective exchange rate indices

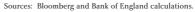


On 21 July, the Chinese authorities announced a change in the yuan exchange rate regime. The yuan was revalued against the dollar by 2.1% and moved to a managed float by reference to a basket of currencies. The exact composition of the reference basket has not been published, but the People's Bank of China (PBoC) has announced that it contains at least eleven currencies, with the US dollar, yen, euro and Korean won being the key components.

This change in the yuan regime had long been anticipated in prices of non-deliverable forwards (NDFs).<sup>(1)</sup> However, in the event, the revaluation was much smaller than had been expected. At the end of the review period, NDFs suggested that further yuan appreciation was still anticipated, and that the implied level of the yuan in twelve months' time was largely unchanged (Chart 10). Following the announcement, Asian currencies initially appreciated against the US dollar, although some of these moves partially unwound following the announcement by the PBoC that they were not planning further adjustments to the currency regime in the near term (Chart 11).

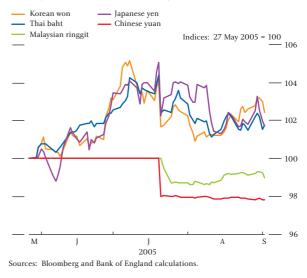






#### Chart 11

# Change in Asian currencies per US dollar

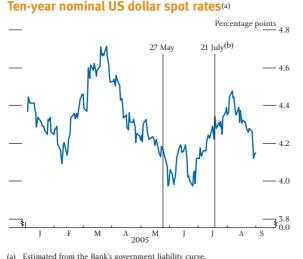


(1) Non-deliverable forwards provide an offshore mechanism to hedge currencies that are otherwise difficult to hedge, either because no local forward market exists, or because foreign banks have only limited access to forward markets. In August, however, the PBoC issued new regulations allowing banks to trade yuan forwards on-shore.

# Longer-term interest rates

Alongside indicators of strengthening activity in the United States, the decision to revalue the yuan may have been another factor that contributed to a rise in longer-term US dollar interest rates in the middle of the review period. In the two weeks following the Chinese announcement, ten-year US Treasury yields rose to a level around 30 basis points higher than at the time of the previous Bulletin before falling back again later in August (Chart 12).

# Chart 12



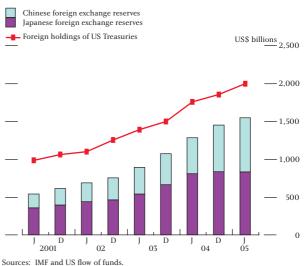
On 21 July, the Chinese authorities announced a change in the yuan exchange (b) rate regime.

Strong demand for US dollar-denominated assets from Asian investors, particularly central banks, has been one factor mentioned for some time by market participants in explaining the fall in US dollar long-term yields over the past couple of years. Market contacts have also suggested that tactical investment management by some Asian investors — buying bonds if yields reach the top of a given range, and selling if they fall to the bottom may have contributed to low realised and implied volatility in bond markets. So the decision to revalue the yuan may have led to speculation about future reductions in the need for Asian central banks to buy US dollar-denominated assets to prevent their currencies from appreciating. But there is little evidence as yet to suggest that growth of foreign holdings of US Treasury bonds has slowed or that Asian central bank foreign exchange reserves have stopped accumulating (Chart 13).

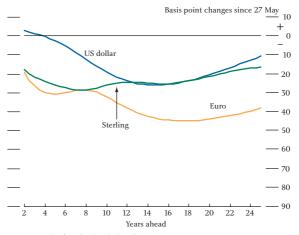
Internationally, ten-year forward rates fell by around 20-40 basis points over the period (Chart 14). Decomposing the movements in nominal long forward rates into real and inflation components suggests that

# Chart 13

# Foreign exchange reserves and foreign holdings of US Treasuries



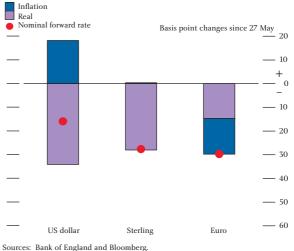
# Chart 14 Changes in implied nominal forward rates(a)



Sources: Bank of England and Bloomberg

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

# Chart 15 Changes in nine-year nominal forward rates(a)

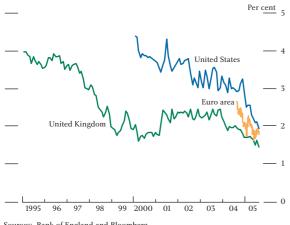


Sterling and dollar real rates derived from the Bank's government liability curves. (a) Real component of euro rates implied by nominal government bond yields less inflation swap rates, which may not be strictly comparable because of credit risk. international long-horizon real forward rates declined over the period (Chart 15). Conceivably, this may in part have reflected some re-evaluation by investors of the potential impact of the further increases in oil prices on long-term global growth prospects.

The falls in real forward rates over the period continued the general downward trend since the start of last year (Chart 16). The precise factors underlying the low level of real long-term real interest rates remained unclear. Real interest rates should move to equate desired saving and planned investment. Desired saving depends on factors such as demographics, changes in asset values and households' uncertainty about future income flows. Planned investment is likely to be affected by factors such as productivity growth, labour force growth and investors' uncertainty about future rates of return. It is therefore possible that lower real interest rates reflected an adjustment to changes in these fundamental influences on savings and investment patterns around the world.<sup>(1)</sup>



International real nine-year forward rates(a)



Sources: Bank of England and Bloomberg.

(a) Instantaneous real forward rates derived from the Bank's government liability curve. Euro rates are implied from nominal government bonds less inflatior swap rates, which may not be strictly comparable owing to credit risk.

One such influence that some commentators have suggested is a fall in the general level of macroeconomic volatility. But the theoretical link between macroeconomic volatility and observed long-term real yields is not straightforward.

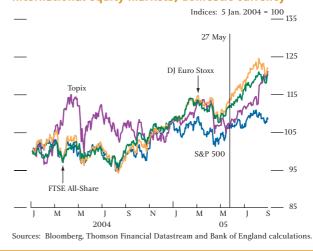
As explained in the box on pages 308–09, many consumption-based asset pricing models suggest that lower levels of macroeconomic volatility might be associated with higher expected (equilibrium) risk-free real interest rates, because less uncertainty encourages investors to reduce precautionary saving. This suggests that if a fall in macroeconomic volatility is to explain any of the observed fall in long-term real interest rates, it should have occurred via a fall in the risk premium associated with holding long-maturity index-linked government bonds (ie the required compensation for bearing uncertainty about future short-term real interest rates).

Other things equal, a fall in macroeconomic volatility should reduce the absolute size of risk premia across asset classes. Finance theory also suggests that, for individual assets, the size and sign of the associated risk premia depends on how the asset's pay-off co-varies with real consumption growth. If one-period returns on multi-period index-linked (credit risk free) bonds are positively correlated with consumption growth, lower macroeconomic volatility could have been a factor in lower long-term real interest rates, via lower risk premia. However, it is possible to construct plausible models where real returns are negatively correlated with consumption growth, and therefore require a negative risk premium. In this case, lower macroeconomic volatility might be expected to lead to a smaller negative risk premium, and therefore higher observed long-term real interest rates.

# **Equity markets**

Lower long-term real interest rates would tend to support equity prices via lower discount rates on future earnings. And indeed, after weakening earlier in the year, international equity prices increased over the past few months, although they fell a little towards the end of the review period. The increases were most significant for the Euro Stoxx, the FTSE and the Topix indices (Chart 17).





(1) This issue was considered in the boxes 'The fall in global long-term real interest rates' in the Spring 2005 Quarterly Bulletin and 'The economics of low long-term bond yields' in the May 2005 Inflation Report.

# Real interest rates and macroeconomic volatility

International real interest rates remain low by historical standards. For example, sterling five-year real interest rates five years ahead (implied by index-linked gilts) have fallen to around 1.5%, compared with a post-1997 average of 2.1%.

Several macroeconomic explanations have been proposed for the low levels, including a rise in savings in Asian economies, sluggish investment growth in some economies, and a glut of corporate saving. Other contributing factors are often grouped under the umbrella of 'market factors'. These include regulatory change in some countries requiring long-term savings institutions to match better the future cash flows on their assets and liabilities; and a decline in liquidity premia on index-linked bonds.

Another explanation, based on macroeconomic fundamentals, is that the observed falls have in part been driven by a decline in the general level of macroeconomic volatility. Using the United Kingdom as an example, there does appear to have been some broad empirical association between the volatility of consumption growth and the level of real forward rates (Chart A).

#### **Chart A**

# Sterling five-year, five-year forward real rates and volatility of consumption growth<sup>(a)</sup>



Sources: ONS and Bank of England calculations.

(a) Standard deviation of annual per capita consumption growth in the United Kingdom over a five-year rolling window.

In principle, macroeconomic volatility could influence yields on long-maturity bonds (and therefore implied forward rates) through two main channels:

 via the equilibrium level of risk-free interest rates (ie theoretical risk-free rates excluding any risk premia) • by influencing the risk premia required for bearing uncertainty about future short-term interest rates and the value attached to the convexity<sup>(1)</sup> of long-term bonds.

#### Volatility and the expected risk-free interest rate

Much of modern asset pricing theory seeks to model the behaviour of a representative investor who must decide how much of his income to consume and how much to invest. In these models, interest rates are related to the expected growth of marginal utility and, in turn, to expected future consumption growth. When expected consumption growth is relatively high, agents may wish to borrow to smooth consumption over time, which would put upward pressure on interest rates.

Consumption-based asset pricing models assume a risk-averse agent who seeks to maximise a utility function.<sup>(2)</sup> Typically in these models, the equilibrium risk-free interest rate:<sup>(3)</sup>

- *increases* with the level of the agent's impatience (impatient agents require a higher return to saving to compensate for deferring consumption);
- *increases* with the expected growth rate of consumption; and
- *decreases* with the volatility of consumption growth.

The latter result arises because a risk-averse agent will seek to hold savings as a precautionary buffer in case income growth is unexpectedly low. Lower macroeconomic volatility, making these outturns less likely, should result in lower levels of such precautionary savings. In turn, the expected interest rate rises in order to maintain the supply of desired savings with planned investment. The more risk-averse the investor, the more pronounced should be the rise in the risk-free interest rate following a fall in volatility.

Assessing the size of the increase in the risk-free interest rate for a given fall in volatility is not straightforward. Simple consumption-based asset pricing models tend not to match observed movements in asset prices, resulting in several well-known 'puzzles'. For example, they often imply a level of risk-free interest rates that is greater than the level generally observed — the 'risk-free rate puzzle'.<sup>(4)</sup> But insofar as the models make some intuitive sense, they

(1) The longer the maturity of a bond, the more convex is the relationship between its price and yield. Convexity is valued because it serves to amplify the positive price impact of a fall in interest rates and to dampen price falls as interest rates rise. As a result, higher volatility means more value is attached to convexity, and yields on long-maturity bonds fall.

(2) The theory set out in this box implicitly assumes a power utility function, where utility, U, is related to consumption, C, via  $U(C_t) = (C_t^{1-\gamma} - 1)/(1 - \gamma)$ , where  $\gamma$  characterises the representative agent's risk aversion.

(4) Some of these puzzles are set out in Campbell, J Y (1999), 'Asset prices, consumption and the business cycle', in Taylor, J B and Woodford, M (eds), Handbook of macroeconomics, Chapter 19, Elsevier.

<sup>(3)</sup> Note that these conclusions are based on comparative static arguments. The model assumes parameters such as impatience and macroeconomic volatility are fixed, and reflect the structure of the economy.
(4) Some of these puzzles are set out in Campbell, J Y (1999), 'Asset prices, consumption and the business cycle', in Taylor, J B and Woodford, M (eds),

suggest that a fall in macroeconomic volatility should lead to higher not lower equilibrium risk-free rates. At the same time, lower macroeconomic volatility might lead investors to attach less value to the convexity of long-maturity bonds, which would put further upward pressure on long-term bond yields.

# Volatility and the risk premium on long-maturity real bonds

The volatility of the macroeconomic environment influences the general price of market risk and, in turn, risk premia associated with all assets, including risk premia on government bonds. If investors expect the observed decline in macroeconomic volatility to be sustained, either because they expect the size of shocks hitting the economy to be smaller, and/or because they perceive that macroeconomic policy makers have become more able to offset shocks successfully, then the absolute size of risk premia may have fallen across asset classes.

The quantity of risk associated with any individual asset and therefore its risk premium — is related to the covariance of the asset's pay-off with marginal utility and hence with consumption.<sup>(5)</sup> An asset with high expected returns when consumption is already high, and low expected returns when consumption is low will tend to add to consumption volatility, which investors are assumed to dislike. As compensation for this, investors will demand higher returns — a positive risk premium. Conversely, investors will require lower returns on assets that are expected to pay out more when consumption is low — ie there is a negative risk premium.

Many assets, such as equities, are typically assumed to have positive risk premia because their pay-off usually increases when the economy is growing robustly. But the situation may be less clear for index-linked government debt.

The price of index-linked government debt is determined by expectations of the future risk-free interest rate, which in turn depends on expected future consumption growth. This suggests that the sign of the risk premium associated with these assets depends crucially on how investors form expectations about future consumption growth.

Suppose investors believed that periods of unusually high consumption growth were expected to be followed by periods of below-trend growth and *vice versa*. Lower future consumption growth would suggest lower future real interest rates, which in turn would reduce yields on longer-maturity indexed bonds. This would cause the price of these bonds to rise (the principal of the bond would be discounted at a lower rate) and give the bondholder a capital gain. So in this scenario, holding period returns on long-maturity bonds (ie the return from holding a long-maturity bond for one period) might be expected to co-vary positively with consumption growth, implying a positive risk premium.<sup>(6)</sup>

Alternatively, if investors assume growth is persistent (so that a positive shock to consumption in one period causes some degree of upward revision to consumption growth expectations in subsequent periods), a favourable shock to current growth would, to some extent, raise growth expectations in subsequent periods. In turn, this would increase the real interest rate in subsequent periods, perhaps via a tightening of monetary policy, and the holder of a multi-period real bond would realise a capital loss. As such, holding period returns of long-maturity bonds would be negatively correlated with consumption growth, implying a negative risk premium.

It is difficult to know the exact mechanism through which investors form their expectations. As a result, even though the absolute size of any risk premium on index-linked bonds would likely decline given a sustained reduction in macroeconomic volatility, it does not necessarily follow that the observed level of long-term real interest rates would fall.

# Reconciling the theory with the observed behaviour of real interest rates

Given the insights from these analytical models, what could explain the observed positive association between macroeconomic volatility and long real forward rates shown in Chart A? First and foremost, the models suggest that the underlying relationship is not straightforward; the apparent positive empirical association belies a much more complex structural relationship between the variables.

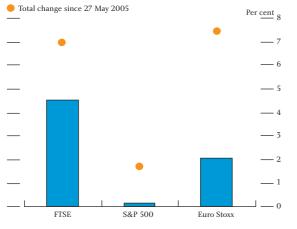
If long-dated real government bonds carry a positive risk premium, the fall in volatility could indeed account for some of the observed decline in real interest rates. Alternatively, if long-dated real government bonds currently have a *negative* risk premium, one could reconcile the observed moves with the analytical models if lower macroeconomic volatility had reflected structural changes which had also altered the risk characteristics of real government bonds. Specifically, if these structural changes had caused the expected covariance between real government bond returns and consumption growth to switch sign, then risk premia on government bonds might have shifted from being positive to negative. But if long-dated real government bonds have, and always have had, negative risk premia associated with them, then it would seem that alternative explanations are required to account for the observed decline in real interest rates.

<sup>(5)</sup> For more details on the price and quantity of risk, see Gai, P and Vause, N (2004), 'Risk appetite: concept and measurement', *Financial Stability Review*, December, pages 127–36.

<sup>(6)</sup> Risk premia are often positive in real term structure models. See for example Campbell, J Y (1986), 'Bond and stock returns in a simple exchange model', *Quarterly Journal of Economics*, Vol. 101, No. 4, pages 785–803; or Morgan Stanley (2005), 'A rough calibration of the UK real yield curve', for a more recent example.

### Chart 18 Accounting for changes in equity prices: contributions of movements in real interest rates(a)

Real interest rate contribution



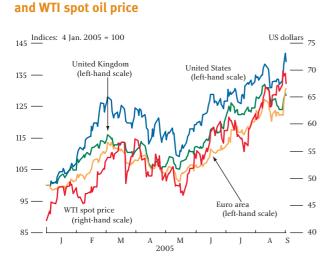
Sources: Bloomberg, Thomson Financial Datastream and Bank of England calculations.

(a) Based on simulations of a dividend discount model. The decomposition uses real interest rates from the Bank's government liability curves. For more details of such decompositions see Panigirtzoglou and Scammell (2002).

However, simulations of a simple dividend discount model suggest that, other things equal, falls in real interest rates are unlikely to have accounted fully for the continued strength in global equity markets over the review period (Chart 18).<sup>(1)</sup>

Some of the recent increases in equity prices could have reflected sector-specific developments. In particular, the continued strength of oil prices has boosted the share prices of oil and other companies in the resources sector (Chart 19).

# Chart 19

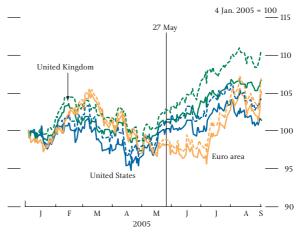


Equity indices for resources sector (local currency)

At the same time, higher oil prices may have squeezed profit margins of non-oil companies. Anecdotal evidence suggests that the further increase in oil prices may have contributed to the slight weakening in equity prices over the final month of the review period. Nonetheless, even after excluding firms from the resources sector, UK, US and euro-area equity indices have all increased over the review period as a whole (Chart 20).

Moreover, a sectoral breakdown of equity price movements suggests that the increase over the period was quite broadly based across sectors, especially in the United Kingdom and the euro area (Chart 21). In fact, equity price movements of different sectors have tended to move more closely together over the past year than

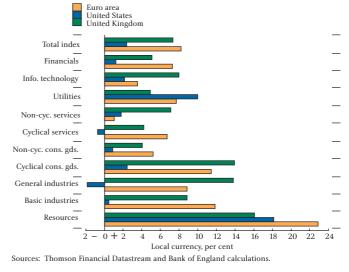
# Chart 20 International equity indices excluding the resources sector<sup>(a)</sup>



Sources: Thomson Financial Datastream and Bank of England calculations.

(a) Dashed lines indicate Thomson Financial Datastream's total market indices in the United Kingdom, United States and euro area.

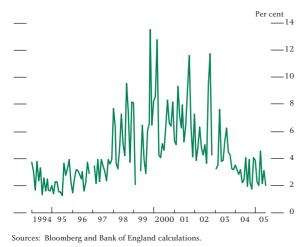




(1) For more details on this decomposition, see Panigirtzoglou, N and Scammell, R (2002), 'Analysts' earnings forecasts and equity valuations', *Bank of England Quarterly Bulletin*, Spring, pages 59–66.

Sources: Bloomberg, Thomson Financial Datastream and Bank of England calculations.

#### Chart 22 Standard deviation of monthly returns across FTSE sectors<sup>(a)</sup>



(a) Returns calculated for each sector between first Wednesday of each month.

in previous years (Chart 22). This suggests that market-wide influences have been relatively more important than idiosyncratic factors over this period.

What other factors might explain the recent increases in stock prices? Reported company earnings growth has increased in 2005 and has generally exceeded market expectations, especially in the United States (Chart 23). Even in the United Kingdom, where output growth has slowed over the past year, aggregate corporate earnings have continued to increase faster than nominal GDP (Chart 24).

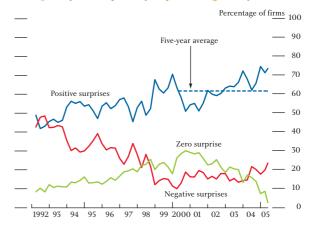
Against the background of higher earnings, the recent continued strength in equity prices does not look particularly unusual. Aggregate price to earnings ratios for both the S&P 500 and the FTSE All-Share have remained close to their averages since 1990 (Chart 25).

As well as increased earnings, the continued strength in global equity prices might have reflected further falls in equity risk premia. This would be consistent with low risk premia in other financial markets. But measures of uncertainty, implied by option prices, rose a little over the period for the major equity indices, although they remained low by recent historical standards (Chart 26).

# Credit

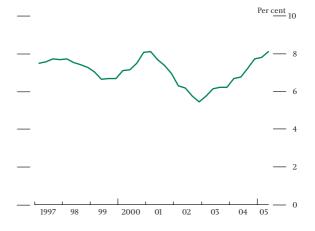
Accompanying higher equity prices, credit spreads on investment-grade corporate bonds and credit default swaps (CDS) narrowed over the period, and returned to the low levels observed at the start of 2005 (Charts 27 and 28). The narrowing appeared more pronounced on

# Chart 23 S&P 500 quarterly company earnings surprises



Sources: Bloomberg and Bank of England calculations.

## Chart 24 FTSE All-Share company earnings as a percentage of nominal GDP



Sources: Bloomberg, ONS and Bank of England calculations.

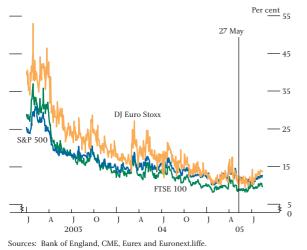
### Chart 25 FTSE All-Share and S&P 500 price to earnings ratios<sup>(a)</sup>



Sources: ONS, Thomson Financial Datastream and Bank of England calculations.

(a) Based on a ten-year trailing average of earnings. Dashed lines represent the average price to earnings ratios since 1990.

# Chart 26 Equity market implied volatilities (three-month constant maturities)



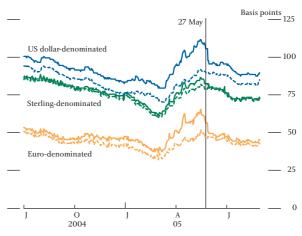
US dollar and euro-denominated spreads, though in part this reflected a change in index composition as car maker GM was removed at the end of May.

Spreads on high-yield and emerging market bonds also narrowed (Charts 29 and 30). Indeed, during the period the EMBI Global composite spread index tightened to the lowest level since the index began in 1998.<sup>(1)</sup> However, arguably in some markets investors may have become a little more discriminating over the period the proportion of 'distressed' corporate debt (crudely defined as debt trading with a spread greater than 1,000 basis points) increased slightly.

More generally, the widespread narrowing in spreads could be consistent with a general improvement in credit quality. High-yield default rates touched an eight-year low during the period and are forecast to fall further in early 2006 (Chart 30). In addition, the renewed narrowing in spreads probably reflected reduced uncertainty surrounding credit markets, following a period of stress at the beginning of May.

In May, credit spreads widened, triggered by concerns related to the downgrades of GM and Ford. These downgrades were significant because, as noted in the Spring *Quarterly Bulletin*, outstanding GM and Ford debt is large relative to the total high-yield market.<sup>(2)</sup> At that time, dealers had appeared nervous about liquidations of positions in more risky and illiquid debt by some hedge funds, perhaps prompted by losses and actual or rumoured investor redemptions. A few contacts had

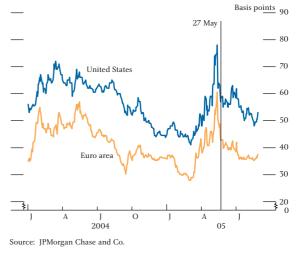
# Chart 27 Option-adjusted corporate bond spreads(a)



Source: Merrill Lynch.

(a) Dashed lines exclude auto sector for US dollar and euro, and consumer cyclicals for sterling.

# Chart 28 Spreads on credit default swap indices(a)



(a) Five-year on-the-run Dow Jones CDX North American investment-grade index (DJ.CDX.NA.IG) and five-year on-the-run iTraxx Europe investment-grade index.

suggested that the widening of bid/offer spreads by dealers may have reflected this concern.

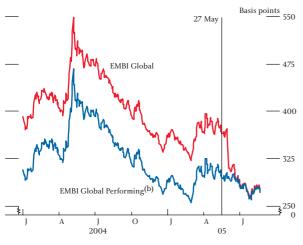
The downgrades also provided an interesting case study into the interaction of credit derivative and cash bond markets during a period of uncertainty. As outlined in the box on pages 314–15, differences in the liquidity of GM and Ford bonds and CDS contracts contributed to a sharp divergence in their relative prices.

High-yield debt issuance stalled in May, particularly in the bond market (Chart 31). Also, the pricing and issuance of several planned leveraged buy-outs (LBOs)

<sup>(1)</sup> Although it should be noted that the index fell by 50 basis points in June after it was rebalanced in response to Argentina's

<sup>debt swap.
(2) For a more detailed account of the credit market stress in May, see Chapter 2 of 'The financial stability conjuncture and outlook',</sup> *Financial Stability Review*, June 2005, pages 50–70.

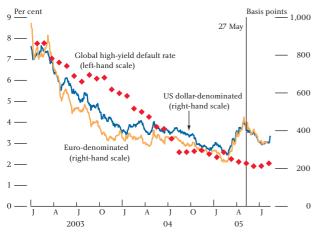
## Chart 29 Emerging market sovereign bond spreads<sup>(a)</sup>



Source: JPMorgan Chase and Co.

(a) Composite EMBI (Emerging Market Bond Index).(b) Excludes defaulted bonds.

## Chart 30 High-yield option-adjusted corporate bond spreads and twelve-month global default rate

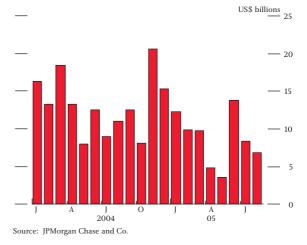


Sources: Merrill Lynch and Moody's.

was delayed during May, and again following the London bombings on 7 July.

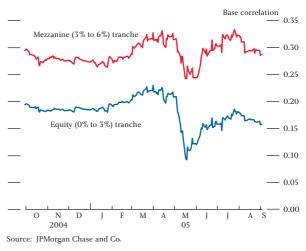
During May, there was also a significant disruption in structured credit markets, ie in markets for products that divide the credit risk on a diversified portfolio of credits into various 'tranches' that differ in their level of subordination. The value of the most risky (equity) tranches of structured credit products fell relative to that of tranches in the middle of the capital structure (mezzanine tranches), which translated into a fall in implied default correlation (ie a fall in the implied likelihood that a number of firms will default at the same time) (Chart 32). To some extent, this may have reflected a change in fundamentals, with idiosyncratic risk

# Chart 31 Monthly high-yield bond issuance



#### Chart 32

# Base correlation of European CDS index equity and mezzanine tranches<sup>(a)</sup>



(a) Five-year on-the-run iTraxx Europe investment-grade index. Base correlations calculated using heterogeneous gaussian copula model.

perceived as higher following the car maker downgrades and with continuing talk of LBOs elsewhere. But it also appears to have been a classic unwind of a 'crowded trade' with dealers and hedge funds, having been long equity tranches and short mezzanine tranches, having taken the view that continuing strong investor demand to take risk on mezzanine tranches had left these relatively expensive.

Most of these spillovers through the credit markets were short-lived. Credit spreads narrowed in June and July. High-yield bond issuance picked up and the decline in European LBO activity was only temporary — volume in 2005 Q2 was 28% greater than in the same period in 2004, and there were 13 deals over €500 million in the first half of the year. The payment-in-kind (PIK)<sup>(1)</sup> market, which investors had perceived as all but closed

(1) A PIK security gives the issuer the option of paying investors in similar securities instead of paying interest coupons. They are generally issued by high-risk companies who value the option of conserving cash.

# Interactions between cash and derivatives markets

Liquidity in derivatives markets has grown rapidly in recent years, making it much easier for financial market participants to isolate and transfer financial risks. Under normal circumstances, the process of market arbitrage means the difference between prices in derivatives and underlying cash instruments is typically small. But occasionally prices may diverge, suggesting underlying market frictions (for example if liquidity is greater in the derivative market) and/or supply constraints in underlying cash instruments. This box reviews two recent examples of such divergences.

# Specials trading and bond futures

In a repurchase agreement (repo) one party lends cash to another, who in turn delivers collateral (such as government bonds) as security for the term of the agreement. The rate at which cash is lent depends not only on the general level of interest rates, but also on the demand for the securities provided as collateral. For example, the holder of a bond that is in short supply may be able to borrow at favourable rates by offering the scarce bond as collateral. In this case, the bond is said to be 'trading special' in the repo market.

The seller of a bond futures contract undertakes to deliver one of a basket of bonds to the buyer during a particular month. The cost of delivering each of these bonds is approximately equalised through a conversion factor. But despite the conversion factor, the cost of delivering each of the bonds will not be the same, and one bond will be the 'cheapest to deliver' (CTD). This can cause very strong demand to borrow the CTD bond from sellers of futures contracts, and may often lead to it trading special in the repo market.

In recent months, large US Treasury futures positions relative to the available supply of the CTD bond in the repo market have led the bond to trade unusually special. In turn, this has increased the frequency of dealers failing to deliver the CTD bond in repo agreements, leading to an increase in the number of

#### **Chart A**





Source: Federal Reserve Bank of New York

failed repo transactions (Chart A). The cost of failing to deliver a bond in the US market is approximately equivalent to borrowing the bond in exchange for lending cash at an interest rate of zero per cent. Indeed, there have been reports that some market participants have lent cash at negative interest rates in exchange for 'guaranteed delivery' of the bond.<sup>(1)</sup>

In response to this, from December onwards, the Chicago Board of Trade has decided to limit the number of futures contracts that can be held by any one institution in the final ten days of the life of each contract. The US Treasury has also announced that it is examining the possibility of introducing a securities lending facility in order to alleviate pressure on repo markets.

# Credit default swaps and cash credit spreads

A credit default swap (CDS) allows investors to separate and transfer the credit risk on a particular reference entity, such as a company or sovereign. The buyer of the CDS is said to buy credit protection and has a similar credit risk position to selling a bond short. The seller of the swap is said to sell protection and has a similar credit risk position to owning a bond.

While a company's CDS price should be closely related to the credit spread on its bonds, several

<sup>(1)</sup> The December 2003 *Financial Stability Review* discusses another instance of increased repo settlement fails, in 2003, while Fleming and Garbade (FRBNY Current Issues, Vol. 10, No. 5) discuss the associated occurrences of negative repo rates.

factors may cause the two to diverge.<sup>(2)</sup> One such factor is the balance of supply and demand in the CDS market. For example, at times, recent high investor demand for synthetic collateralised debt obligation (CDO) tranches may have contributed to a narrowing in the difference (or 'basis') between CDS spreads and bond spreads. This is because dealers that sell these credit portfolio products (ie buy credit protection) may hedge their positions by selling credit protection in the single-name CDS market.

Typically, the CDS spread exceeds the cash spread by a small amount. One reason for this is that an investor seeking to take a negative view of a company's credit prospects can do so either by selling its bonds short or buying protection using CDS. But because the supply of bonds is limited, it may be expensive (or even impossible) to borrow the bond in order to cover the short position. This may lead investors to buy credit protection in the CDS market rather than attempting to short the company's bonds, so widening the CDS-bond basis.

If demand to take a negative view on a company's credit standing suddenly increases, the difference between bond and CDS spreads can widen sharply. A recent illustration of such a divergence occurred following the ratings downgrades of GM and Ford. Early this year, the basis between five-year GM CDS spreads and spreads on GM bonds of a similar maturity had been, as usual, slightly positive. GM released a profit warning in March, prompting speculation that its credit rating would be downgraded to sub-investment grade. Indeed, S&P did downgrade GM and Ford as well as their financing subsidiaries to sub-investment grade in May.

Both the bond spread and the CDS spread widened significantly in response to the news (Chart B). But the reaction was much greater in the CDS market, with the CDS-bond basis rising to around 300 basis points in mid-May (Chart C). This rise in the basis could be attributed to investors finding it easier to take a negative view of GM's prospects in the CDS market than in the bond market, where it was expensive to borrow bonds in order to sell them short

# Chart B

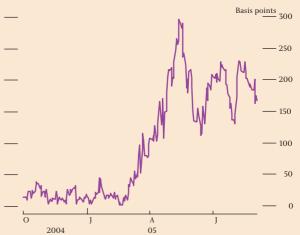




Sources: Mark-it Partners, Merrill Lynch and Bank of England calculations

# Chart C





Sources: Mark-it Partners, Merrill Lynch and Bank of England calculations. (a) Difference between five-year CDS premium and credit spread on Jan. 2011 bond.

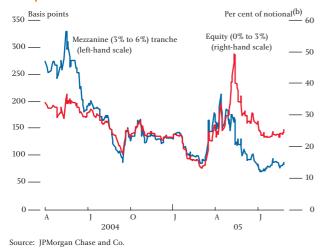
(that is, the bonds were trading special). Once GM's spreads began to decline in late May and June, much of the increase in the CDS-bond basis unwound sharply, perhaps indicating a high number of speculative positions in the CDS market. There were similar, although somewhat less marked, movements in Ford's CDS-bond basis.

# Summary

These examples demonstrate that it is sometimes important to consider developments in both cash and derivative markets when interpreting asset price developments. Divergences between cash and derivative market prices may also give clues about market dynamics and the trading strategies of different groups of investors.

<sup>(2)</sup> Some of these factors are discussed on pages 130–32 of Rule, D (2001), The credit derivatives market: its development and possible implications for financial stability, *Financial Stability Review*, June.

## Chart 33 Equity and mezzanine tranche spreads of European CDS index<sup>(a)</sup>



(a) Five-year on-the-run iTraxx Europe investment-grade index.
 (b) Equity tranches are quoted as an upfront price (a per cent of the notional transaction size). A higher price for credit protection indicates an increase in tranche risk, so the upfront price acts like a spread.

during the May credit stress, appeared to re-open, with issuers tapping the market with innovative PIK products.

The structured credit market also appears to have recovered quickly from the May episode (Chart 33). Tranche spreads have narrowed, and the speed of price recovery is consistent with the disturbance having been confined to a relatively small number of dealers and investors.

# Risk appetite and the search for yield

Taken together, the rise in global equities, the narrowing in credit spreads, and the continued low levels of market volatility suggest that the May credit stress has not dented investors' appetite to take risk.

In part, this could be a natural response to a fall in the general price of risk, driven by a reduction in uncertainty surrounding the macroeconomic environment. More specifically, low and stable inflation, less volatile output growth, less fragile corporate and financial balance sheets in industrial countries, and stronger national balance sheets in many emerging market economies may all have contributed to a fall in required risk premia (see the box on pages 308–09).

But the low price of risk may also reflect some degree of mispricing by investors. In particular, some investors may have underestimated new channels for contagion created by innovative financial instruments. Alternatively, they may have unrealistic expectations about the ability of macroeconomic policy makers to offset shocks in the economy. If a mispricing has occurred, the eventual correction in the price of risk could pose a threat to the wider financial system.

Recent issues of the Bank's *Financial Stability Review* have identified two adjustment mechanisms that could possibly have implications for the financial system. First, credit problems may build up gradually if a sustained mispricing of credit risk results in an over-accumulation of debt. Second, it is possible that, at some point, there could be an asset price correction in fixed-income markets, which might spill over to other parts of the system, potentially straining market liquidity.

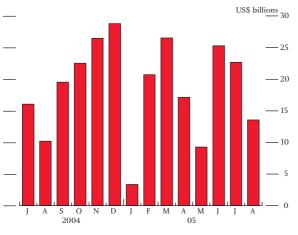
Despite the period of credit market stress in May, it is not obvious that the risks associated with these possible adjustment mechanisms have become any less significant, as many of the factors characterising the 'search for yield' remain intact. Against the background of continuing global low real interest rates and plentiful liquidity in financial markets, investors seem to have continued to seek out new investments to generate higher returns, often through increased leverage. This is most evident in the continued strength in credit markets. In the leveraged loan market, spreads have fallen, covenants and collateral requirements are reported to have been loosened and leverage multiples to have risen.

Likewise, underlying demand from continental European and Asian financial institutions to take risk on collateralised debt obligations (CDOs) — the so-called 'structured credit bid' — has remained strong. This has been an important manifestation of the search for yield because asset purchases by leveraged CDO vehicles have contributed to the downward pressure on credit spreads across a range of credit instruments in recent years, including CDS, asset-backed securities and leveraged loans.

There has reportedly been some reduction in demand for the most complex structured products such as mezzanine tranches of CDO-squared. But overall issuance volumes do not suggest a desire to take less risk (Chart 34). Rather, the strategies used to generate a 'mezzanine-like' return may have changed.

For example, market commentators report that investors who had typically bought mezzanine credit risk have

Chart 34 Global funded CDO issuance



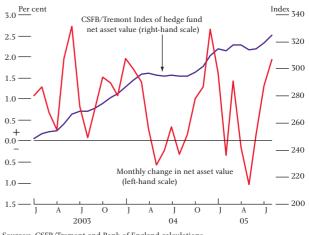
Source: JPMorgan Chase and Co.

taken leveraged exposure to super-senior tranches<sup>(1)</sup> of CDOs and CDS indices, or taking equity tranche exposure via credit constant proportion portfolio insurance (CPPI) transactions.<sup>(2)</sup> So investors may have reacted to the rise in the relative price of mezzanine tranches (ie the fall in implied correlation) in May by seeking better returns through structures that offer leveraged exposures to the most senior parts of the capital structure and deleveraged exposures to the most junior. Some dealers may also have seen such structures as a way of reducing their exposure to changes in implied credit correlation: rather than taking 'long equity, short mezzanine' positions themselves (the trade that had suffered unexpectedly high losses in May) or seeking to transfer such positions to hedge funds, they may have been looking to transfer the risk on more parts of the capital structure to end investors.

A continued search for yield has also been evident elsewhere. In particular, market contacts have noted significant growth in commodity-backed investments such as exchange-traded commodity funds. Market contacts have also remarked on strong capital inflows into local currency debt markets in countries like the Czech Republic and Poland. Similarly, a number of supranational agencies have recently issued debt in emerging market currencies (for example the Mexican peso and the Turkish lira) in response to strong investor demand.

In large part, the speculative community appears to have shrugged off the May disturbance; flows into hedge funds remained robust in 2005 Q2, despite some funds suffering relatively poor returns in May. Redemptions were said to have been smaller than was feared at the end of June. And, in aggregate, hedge funds posted positive returns in the second quarter (Chart 35).

# Chart 35 Hedge fund performance



Sources: CSFB/Tremont and Bank of England calculations.

In summary, for a short period in the late spring, market rumours about potential scaling-back of positions had led some market participants to believe the initial disturbance might prompt a more general correction in asset prices. In the event, financial markets seem to have come through the May disturbance relatively unscathed. This may have been because the disruption in May was contained within a small number of dealers and hedge funds, and did not spill over to the wider group of investors. Moreover, the disturbance was not strong or widespread enough to generate significant and damaging concerns about counterparty credit risk. In this respect, there remains the possibility that a more significant shock could trigger a more sustained and general asset price correction. Drawing on market intelligence from its contacts, the Bank will continue to monitor developments and report them in future editions of the Quarterly Bulletin and Financial Stability Review.

# **Developments in market structure**

#### London bombings

On the morning of 7 July 2005, there were four explosions on public transport in Central London. This

<sup>(1)</sup> Tranches of CDOs that are above AAA-rated tranches in the capital structure are called 'super-senior' tranches. The

likelihood of a super-senior tranche suffering default losses are remote and so they typically earn only a very small spread.

<sup>(2)</sup> CPPI structures are a variant of portfolio insurance: funds are typically allocated between risk-free and risky assets (in this case, structured credit products). When the risky assets are performing well, more funds are allocated to them. Conversely, when they are performing less well, more funds are held in risk-free with the aim of protecting overall returns.

was followed by a further four attempted bombings on 21 July 2005.

In addition to the London Clearing House, one other financial institution evacuated its offices on 7 July but continued trading from contingency locations. Some banks also decided to switch trading temporarily to other centres. And some infrastructure providers made amendments to their normal operations. However, the majority of institutions followed official advice that staff should stay inside their offices, and continued business as normal, especially once some of the uncertainty about the nature of events had subsided.

The sterling payment systems operated without interruption; the Bank was able to conduct its routine operations without problems. The only small change was that the Bank provided all the funds needed by the market at 12.15, following the MPC announcement that day, rather than holding back at least £200 million until its 14.30 round of operations, as it would normally. This was a response to information from the Bank's counterparties that market participants were seeking to square off positions earlier in the day than normal.

The Tripartite Authorities (HMT, FSA, and the Bank) received input from participants and infrastructure providers via a conference call of a cross market group. The Bank also consulted members of the Money Market Liaison Group and chaired conference calls of the Foreign Exchange Joint Standing Committee (FXJSC) and FXJSC Operations subgroup.

One business continuity service provider reported 28 invocation calls and 84 stand-by requests following the 7 July bombings. But by 11 July all firms had returned to their usual arrangements.

# Credit derivative confirmations and assignments

Since 2001, the Bank's *Financial Stability Review* has noted the rapid growth in credit derivatives trading and questioned whether back offices were coping effectively with the associated increase in trade processing volumes. Over the current review period, more users, including many hedge funds, have signed up to the Depository Trust and Clearing Corporation's (DTCC's) matching system, which has become a popular vehicle to tackle the confirmations backlog. DTCC was reported to have around 20 dealers participating in its system and signed its 100th end-user (many of which are hedge funds) over the review period. Also, a new platform, known as T-zero, was launched by Creditex. It aims to introduce electronic capture and straight-through processing of CDS trades from various front-office trading methods (voice brokered, electronic, telephone) with same-day electronic confirmation.

A related issue is that of assignments (typically where a hedge funds assigns a derivatives transaction with one dealer to another dealer, so that the original dealer now has a trade with the new dealer). Assigning trades to third parties without informing the original dealer could potentially impede effective risk management in stressed conditions.<sup>(1)</sup> To address this, the International Swaps and Derivatives Association (ISDA) has published a protocol designed to make it easier for the original dealer to give its consent.<sup>(2)</sup> Obtaining consent is important to ensure that the assignment is legally robust and therefore that the parties involved are certain about their market and counterparty credit risk exposures.

### **Exchange-traded futures markets**

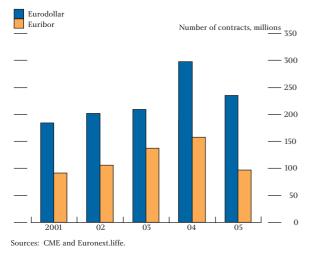
Trading volumes of short-term interest rate futures contracts have risen rapidly over recent years (Chart 36). For example, volumes of Eurodollar futures contracts traded on the Chicago Mercantile Exchange (CME) from January to July 2005 were around 40% higher than the equivalent period in 2004. Contacts say that this growth is mainly due to the shift towards electronic trading, which has reduced risks and lowered trading costs. In July, around 85% of Eurodollar futures were traded electronically, involving mainly shorter-term, more liquid contracts. Longer-term contracts on the CME are still pit-traded as are most Eurodollar options.

Electronic trading may also have contributed to rapid growth in trading volumes via increased activity of traders in 'arcades' (although arcade traders typically take only intraday positions). Arcades are vehicles that typically provide trading facilities and a legal, risk management and physical structure in return for a share of trading profits.

<sup>(1)</sup> For more details, see the speech by Paul Tucker, the Bank's Executive Director for Markets, available at www.bankofengland.co.uk/publications/speeches/2005/speech251.pdf.

<sup>(2)</sup> See www.isda.org/2005novationprot/2005novationprot.html.

# Chart 36 **Eurodollar and Euribor futures volumes**(a)



(a) 2005 data covers the January to July period.

As noted in the Summer Quarterly Bulletin, trading volumes of short sterling futures and options have also been increasing sharply. Contacts suggest that the increase in global trading of short-term interest rate expectations in part reflects increased activity of fixed income and macro hedge funds.

# Removal of bankers' acceptances from the Bank's eligible collateral list

Bankers' acceptances ceased to be eligible for Bank of England money market operations on 17 August 2005, following a six-month transition period. The change had been announced on 11 February 2005. The use of eligible bankers' acceptances in the operations had declined to the point where they formed an insignificant part of the Bank's overall collateral pool. Bills of exchange, including bankers' acceptances, had historically played an important part in the short-term financing of some firms. In recent years, however, and as discussed in previous Quarterly Bulletins, the role of bill finance had declined markedly as firms developed other sources of borrowing. By late 2004, the size of the

eligible acceptance market had fallen below £1 billion compared with £18 billion in 1998.

#### Long-dated bond issues

The US Treasury announced in its 3 August Quarterly Refunding Statement its intention to re-issue a 30-year bond from 2006 Q1; the size of the issuance was unspecified. In addition, the United Kingdom's Debt Management Office (DMO) announced that it will issue the first ultra-long index-linked gilt, maturing on 22 November 2055, by means of a syndicated offering rather than an auction (although the DMO will revert to the use of auctions for subsequent issuance of ultra-long gilts). It will also be the first index-linked gilt to use a three-month indexation lag.

# **Bank of England official operations**

### Changes in the Bank of England balance sheet

The size of the sterling components of the Bank's balance sheet increased slightly, reflecting a rise in banknotes issued and a corresponding increase in the stock of financing via open market operations (OMOs) (Table B). Other elements of the Bank's balance sheet — including the sterling value of the foreign-currency components - changed little. Notes in circulation fluctuated with seasonal and weekly variation in demand for banknotes (Chart 37).

The Bank purchased gilts over the period in accordance with its published screen announcements; £31.4 million of 4<sup>3</sup>/<sub>4</sub>% 2015 in June, £31.4 million of 5% 2010 in July and £31.4 million of 5% 2012 in August. A screen announcement on 1 September 2005 detailed the purchases to be made over the following three months.

The Bank maintained the value of its three and six-month euro-denominated bills outstanding at  $\in$  3.6 billion, issuing new bills on a monthly basis as old bills matured. The average indicative spread to Euribor

#### Table B

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

£ billions	

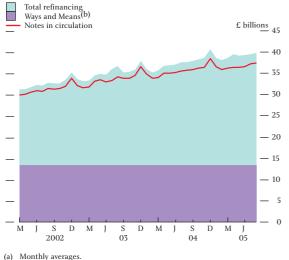
Liabilities	<u>2 Sep.</u>	27 May	Assets	2 Sep.	27 May
Banknote issue Settlement bank balances Other sterling deposits, cash ratio deposits and the Bank of England's capital and Foreign currency denominated liabilities	41 <0.1 reserves 9 14	39 <0.1 9 15	Stock of refinancing Ways and Means advance Other sterling-denominated assets Foreign currency denominated assets	30 13 4 17	28 13 4 18
Total <sup>(c)</sup>	64	63	Total <sup>(c)</sup>	64	63

For accounting purposes the Bank of England's balance sheet is divided into two accounting entities: Issue Department and Banking Department.

See 'Components of the Bank of England's balance sheet' (2003), Bank of England Quarterly Bulletin, Spring, page 18. Based on published weekly Bank Returns. The Bank also uses currency, foreign exchange and interest rate swaps to hedge and manage currency and non-sterling interest rate exposures — see the Bank's 2003 Annual Report, pages 53 and 73–79 for a description.

Figures may not sum to totals due to rounding.

# Chart 37 Banknotes in circulation, the stock of OMO refinancing, and 'Ways and Means'(a)

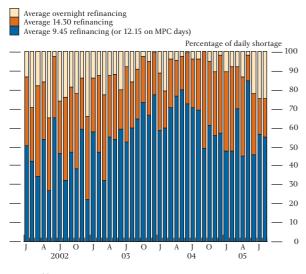


(b) An illiquid advance to HM Government. This fluctuated prior to the transfer of responsibility for UK central government cash management to the UK Debt Management Office in April 2000. The Ways and Means is now usually constant.

of three-month issuance narrowed to 9.5 basis points below Euribor, compared with 10.0 basis points over the previous review period; for six-month bills, the average issuance spread narrowed slightly to 10.6 basis points below Euribor from 10.7 basis points. The total nominal value of Bank euro notes outstanding remained at  $\notin$ 6 billion.

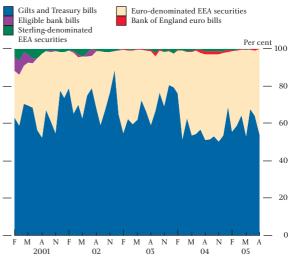
In the Bank's daily OMOs in the sterling money markets, the amount of overnight financing through late lending increased over the period with an equivalent reduction in two-week financing through the earlier rounds of operations (Chart 38). In part, this may have reflected

#### Chart 38 Refinancing provided in the Bank's open market operations<sup>(a)</sup>



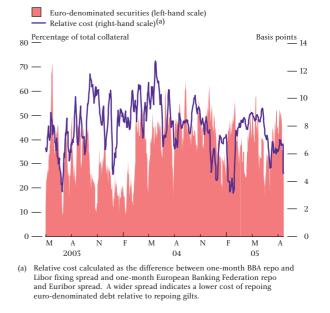
(a) Monthly averages.

# Chart 39 Instruments used as OMO collateral<sup>(a)</sup>



(a) Monthly averages

# Chart 40 Relative cost and use in OMOs of euro-denominated EEA government securities



the reduction in the spread charged on the Bank's overnight lending facilities from 100 to 25 basis points above the MPC official rate, as part of the interim money market reforms that took effect on 14 March.

On 25 July, the Bank aligned the list of collateral eligible for intraday credit in its sterling real-time gross settlement (RTGS) payment system with the list of collateral eligible for liquidity in its OMOs. This change had been formally announced to all members of the RTGS service on 22 April. Following the change, the RTGS and OMO lists comprise sterling and euro-denominated securities issued by EEA central governments, central banks and certain international organisations. The Bank also requires issuers of these bonds to be rated Aa3 (on the Moody's scale) or higher by two or more of the Moody's, Standard & Poors, and Fitch rating agencies.

On average, the use of euro-denominated collateral by counterparties participating in the Bank's OMOs decreased slightly over the period (Chart 39), in line with an increase in its average relative cost (Chart 40).

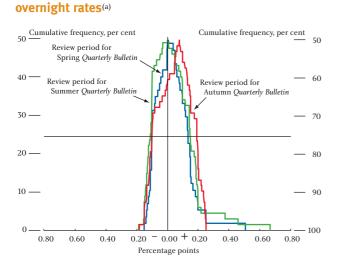
### Short-dated interest rates

The primary objective of the Bank's operations in the sterling money markets is for overnight market interest rates to be in line with the MPC's official rate, so that there is a flat money market yield curve out to the next MPC decision date, with very limited day-to-day or intraday volatility in market interest rates out to that horizon.

The distribution of the spread between the sterling secured (gilt GC repo) overnight rate and the official Bank repo rate has narrowed in the most recent review period (Chart 41). This is the first full review period since the introduction of interim reforms to the Bank's operations in the sterling money markets, which included a narrowing of the interest rate 'corridor' on the Bank's overnight lending and deposit facilities to +/- 25 basis points from +/- 100 basis points.

The package of interim reforms also introduced indexing of the rate charged on the Bank's daily two-week repos to the official interest rate. One aim of indexing was to

#### Chart 41 Cumulative folded distribution of sterling secured



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

(1) Pivoting is described on page 129 of the Summer 2004 Quarterly Bulletin.

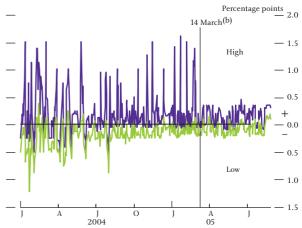
eliminate so-called 'pivoting' ahead of MPC meetings. Pivoting had caused a perverse rise in the relevant overnight rate in the run-up to MPC meetings at which the official rate was expected to be cut, and *vice versa*. It was previously observed ahead of the June and August 2004 MPC meetings.<sup>(1)</sup>

Indexing appeared to eliminate 'pivoting' successfully ahead of the August MPC meeting, when market participants were widely expecting a reduction in the official rate. The average spread between the highest and lowest sterling overnight market interest rate traded each day has narrowed and peaks in the overnight rate have been significantly lower since the interim reforms took effect (Chart 42).

Overnight market rates were closer to the official rate over the review period than in recent years (Chart 43).



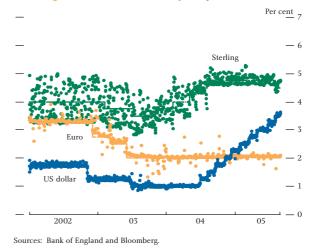




(a) High and low of the day observed by the Bank's dealing desk as a spread

to the policy rate.(b) On 14 March, the Bank implemented interim reforms to its operations in the sterling money markets.

## Chart 43 Overnight interest rates and policy rates

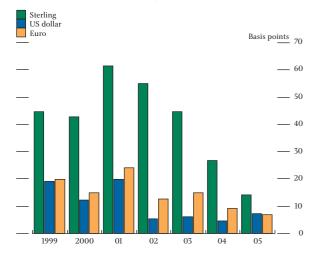


They were still slightly more volatile than comparable dollar and euro rates, but the difference has narrowed markedly over the past year (Chart 44). The Bank's full money market reforms are intended to reduce volatility further.

A wide range of counterparties continued to participate in the Bank's OMOs and there was a small further decrease in the concentration of the stock of financing (implying more counterparties were participating in operations) over the period (Chart 45).

# Chart 44

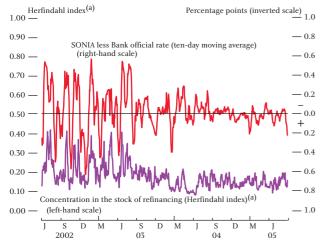
# Standard deviation of difference between official interest rates and overnight interest rates<sup>(a)</sup>



Sources: Bloomberg and Bank of England calculations.

(a) Overnight interest rates are SONIA for sterling, the Fed funds rate for US dollar and EONIA for euro.

### Chart 45 SONIA relative to the Bank official rate and concentration in the stock of OMO refinancing



(a) The Herfindahl index is calculated by squaring the share of refinancing held by each counterparty and then summing the resulting numbers. An index of one implies a single counterparty accounted for the entire stock of refinancing ie high concentration. As the index approaches zero, concentration falls.

# Forecasting the liquidity shortage

The average accuracy of the Bank's liquidity forecast remained broadly similar to previous quarters (Table C).

Over recent months, flows in the end-of-day schemes for settlement banks have fallen. Average payments in both the Bank of England Late Transfer Scheme (BELTS) and End-of-Day Transfer Scheme (EoDTS) decreased over the period (Chart 46). This could be because fewer flows are occurring late in the day so the clearing banks are able to make more accurate forecasts of their end-of-day positions — over a longer horizon, the clearing banks attribute some of the observed decline to less uncertainty about the end-of-day positions following the merger of CMO into CREST in October 2003. EoDTS and BELTS will cease after the full range of money market reforms are introduced.

#### Table C

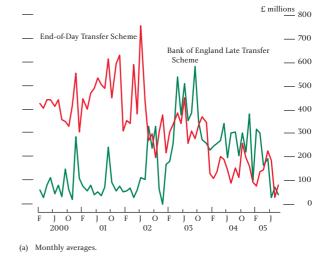
### Intraday forecasts versus actual liquidity shortages

Mean absolute difference (standard deviation), £ millions

	9.45 forecast	14.30 forecast	16.20 forecast
2002 2003 2004 Q1 2004 Q2 2004 Q3 2004 Q4 2005 Q1 2005 Q2	83 (107) 101 (123) 120 (108) 115 (123) 89 (69) 107 (115) 117 (121) 122 (111)	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{cccc} 30 & (73) \\ 51 & (85) \\ 55 & (43) \\ 61 & (74) \\ 52 & (32) \\ 57 & (63) \\ 63 & (77) \\ 62 & (95) \end{array}$
July-2 September	113 (97)	56 (45)	54 (45)

#### Chart 46

# Bank of England Late Transfer Scheme and End-of-Day Transfer Scheme<sup>(a)</sup>



# Progress on money market reform

A consultative paper on transitional arrangements<sup>(1)</sup> to the reformed system was published in August. In

(1) Available at www.bankofengland.co.uk/markets/moneymarketreform/transarrang050823.pdf.

particular, it contained proposals for repo lending by the Bank at longer maturities (of six to twelve months).

The draft legal and operational documentation<sup>(1)</sup> for the reformed system was published in July. The final version of the documentation will be published later in the year, together with a timetable for submitting applications to participate in the new system.

The levels of interest in participating in the new system are encouraging. Around 40–50 eligible<sup>(2)</sup> banks and building societies are planning to become reserve scheme members and around 50–60 are planning to have access to the Bank's standing facilities.

The Bank's own preparations are progressing well. Development of all the main IT systems (ie accounting, collateral management, reserves and liquidity forecasting systems) has now been completed and they have gone into trialling.

The Bank continues to expect the new system to be launched during the period March to June 2006. As noted in the box on pages 324–25, discussions at the Money Market Liaison Group have indicated that most market participants appeared on-track for this timetable.

 $(1)\ Available\ at\ www.bankofengland.co.uk/markets/moneymarketreform/smmreform 050722.pdf.$ 

<sup>(2)</sup> Broadly, eligible banks comprise UK banks and building societies that have sufficient sterling eligible liabilities to be required to hold cash ratio deposits with the Bank.

# The work of the money market liaison group

The money market liaison group (MMLG) was established in 1999 following a series of reforms to the sterling money markets. Typically, it meets quarterly and comprises representatives from market participants, trade associations and the authorities.

It provides a high-level forum for discussion of market or structural developments affecting sterling money markets and related infrastructure and, where appropriate, responses to them. The format of the meeting was altered this year to make a greater distinction between, on the one hand, the Bank communicating and consulting on developments in its official operations and, on the other hand, wider market issues. The latter includes regular reports from infrastructure providers, trade associations, the FSA and the DMO. Minutes of MMLG meetings are published on the Bank's website.

# Discussion of developments in the Bank of England's official operations

Over the past year, the Bank has informed and, where appropriate, consulted the group on its proposals for money market reform and changes to the collateral taken in its operations.

# Money market reform

The Bank has kept the group informed at each stage of the reform process. This has included the Bank's two market consultations on reform proposals in mid and late 2004, the subsequent introduction of interim reform measures in March 2005, the final decisions on the reformed framework in April, planning of the conference held by the Bank for prospective reserve account holders in April, and progress on the preparations for the launch of the new framework.

#### Collateral taken in the Bank's official operations

The group was informed of two significant changes to the Bank's collateral arrangements over the past year. First, the Bank introduced collateral concentration limits such that its counterparties and settlement banks now need to ensure that the securities of a single issuer (other than the UK government and the Bank of England) comprise no more than 25% of the total collateral that they repo to the Bank in open market operations and for intraday liquidity in the RTGS payment system. The Bank explained at the September 2004 MMLG meeting that the decision was motivated by risk management and was a response to the gradual shift in the collateral received by the Bank towards euro-denominated paper, with an increasing share issued by a small number of governments.

Second, the Bank aligned the collateral lists for its open market operations and for intraday RTGS liquidity. The Bank explained to the MMLG that collateral taken intraday should have the same credit standards as collateral taken against term lending as the Bank might have to extend intraday liquidity overnight — for example, following disruption to payment and settlement systems.

# Discussions/initiatives relating to wider issues for the sterling money market

Wider market issues discussed by the group over the past year have included:

# Decision-taking in the sterling money markets in a crisis: responsibilities and process

In the event of a crisis in the sterling money market, the MMLG has a twin co-ordinating role: to provide a means of communication using conference call arrangements; and, if required, to make recommendations on trading or market conventions. The MMLG has been agreeing a table showing how decision making would work in a crisis, setting out the respective roles of the Bank, CRESTCo, CHAPSCo and MMLG. This table will be published on the Bank's website shortly.

# *Guidance on the timetable for the allocation of ISINs to CD issues in CREST*

A timetable was drawn up following work by a MMLG subgroup and posted on the MMLG website.<sup>(1)</sup> The stated aim is to ensure that ISINs are issued within one hour of trading unless otherwise agreed by the issuer and investor.

# *Change from brokers quoting short-dated interest rates in fractions to decimals*

One of the aims of the MMLG is to identify and address areas where the functioning of the sterling money market could be improved. In a discussion at a MMLG meeting a year ago, there was widespread agreement that it would be sensible for market participants to switch the quoting and trading of short-dated sterling interest rates from fractions to decimals in the

(1) www.bankofengland.co.uk/markets/money/smmlg.htm.

interest of modernising the market. This switch subsequently took place from the start of 2005.

# *Discussions about sterling short-term interest rate futures*

At recent meetings, MMLG has discussed the cases for introducing a sterling overnight interest rate (SONIA) swap future and for reducing the tick size for the existing short sterling futures contract on LIFFE. The LIFFE representative on the group reported at the June meeting that consultation with interested parties had revealed that these proposals did not have the support of sufficient market participants.

### Other issues

Other topics raised by members at recent MMLG meetings have included: the London Clearing House's plans to add gilt delivery-by-value (DBV) repo transactions to its existing gilt repo clearing service; plans for the future CREST/Euroclear single settlement platform; the timing of the sterling overnight interest rate average (SONIA) fixing; and proposed compensation arrangements for failed payments in sterling being developed by the APACS Liquidity Managers Group.