Markets and operations

This article reviews developments since the Summer *Quarterly Bulletin* in global financial markets. It summarises asset price movements in conjunction with market intelligence gathered from market contacts, and evaluates these in the context of the Bank's core purposes. The article also outlines changes in market structure and reviews the Bank's official operations.[1]

Global financial markets

Overview

Financial markets were more settled following the sharp increase in market volatility and falls in many asset prices between mid-May and mid-June. Realised and implied volatility in a number of asset classes fell back towards the levels observed in 2006 Q1 and much of 2005. Overall, the fall-out from the turbulence in financial markets in May and June appears to have been limited. Some market contacts have suggested that the events were simply a 'blowing off of the speculative froth' that had been building up earlier in the year, with the period of heightened volatility mainly reflecting adjustment to traders' and short-term investors' positions.

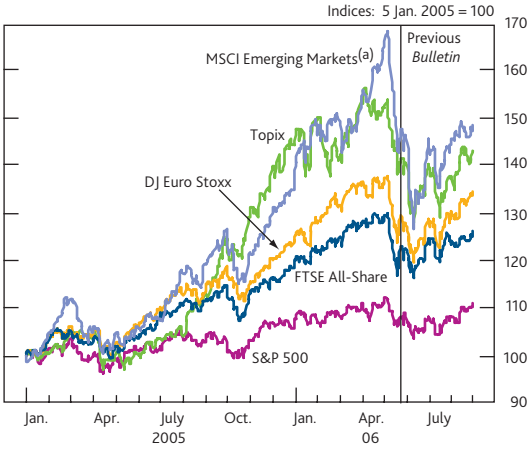
Indeed, it would appear that a number of the key elements of the 'search for yield' — described in previous editions of the *Bulletin* and *Financial Stability Report* — remained largely intact. In particular, the repackaging of credit risk through collateralised debt obligations (CDOs) backed by assets such as commercial real estate loans, home equity loans and leveraged loans continued unabated. And demand to invest in the leveraged loan market remained high, with some contacts suggesting that leverage had reached unsustainable levels. More generally, credit markets were resilient and credit spreads remained narrow, despite further increases in official interest rates across the major economies.

Recent developments in global capital markets

Having fallen sharply in May and June, global equity prices gradually recovered albeit to levels below their local peaks reached earlier in the year (**Chart 1**). The swings in emerging market economy (EME) equity markets were particularly large.

Implied volatility of the major equity indices rose sharply in May and June. And heightened investor uncertainty also manifested itself in primary equity markets, with a sharp slowdown in US initial public offering (IPO) volumes. In the period June to August, 29 IPOs worth around 6^{1}/_{4}$ billion were withdrawn or postponed in the United States, compared with

Chart 1 International equity indices



Sources: Bloomberg, Morgan Stanley Capital International Inc. (MSCI) and Bank calculations.

(a) The MSCI Emerging Markets index is a capitalisation-weighted index that monitors the performance of stocks in emerging markets.

fourteen deals worth around $2 billion in the previous five months. Implied equity market volatility subsequently declined, although perceived downside risks to US and UK equity markets remained greater than earlier in the year (**Chart 2**).

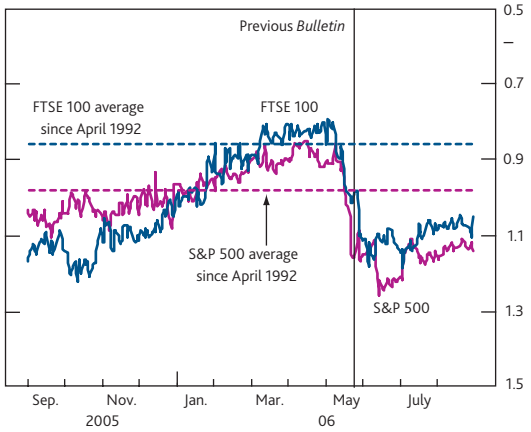
As with equity markets, most (non-energy) commodity prices gradually recovered following sharp falls in May and June (**Chart 3**). However, markets for a number of individual commodities remained volatile. In particular, copper prices were affected by a strike at Escondida, the world's largest copper mine, and nickel inventories reportedly reached historically low levels. In oil markets, the temporary partial shutdown of BP's Prudhoe Bay oil field and tensions in the Middle East added to price volatility. And oil prices fell markedly in August offsetting earlier rises.

Many EME currencies depreciated quite sharply against the US dollar from mid-May to mid-June (**Chart 4**), partly as a by-product of speculative exposures to EME equity and credit

(1) This article focuses on global capital markets. The data cut-off for this article is 1 September.

markets being cut and the funds repatriated. Subsequently, most of these currencies recovered, albeit to differing degrees. Some investors may have sought temporary shelter from volatility in EME markets by holding US dollar-denominated assets. In turn, this could have contributed to a slight appreciation of the dollar in May and June (**Chart 5**).

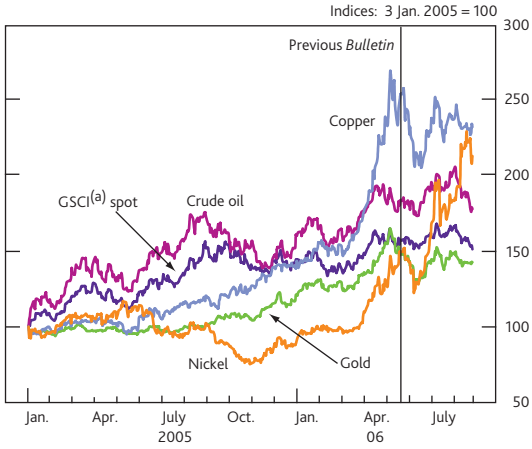
Chart 2 Implied equity market asymmetry[a]



Sources: Chicago Mercantile Exchange, Euronext.liffe and Bank calculations.

(a) Implied asymmetry is measured by the skewness of the distribution of returns implied by option prices. A negatively skewed distribution is one for which large negative deviations from the mean are more likely than large positive deviations. Measures shown are six-month skews.

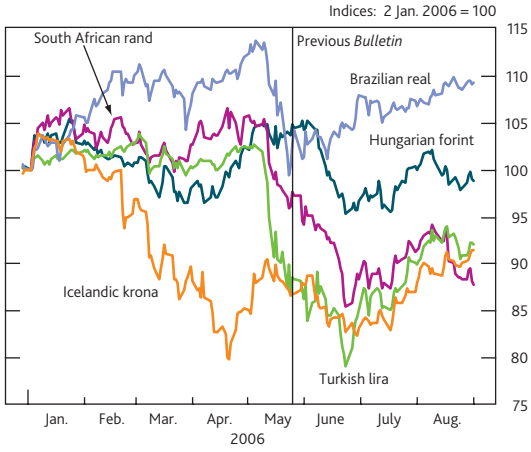
Chart 3 Selected commodity prices



Source: Bloomberg.

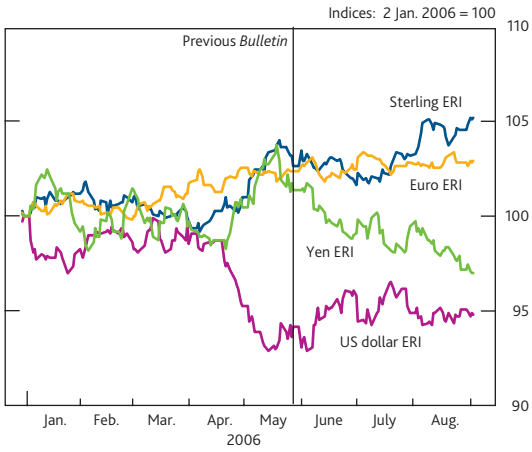
(a) Goldman Sachs Commodity Index.

Chart 4 Emerging market currencies against the US dollar



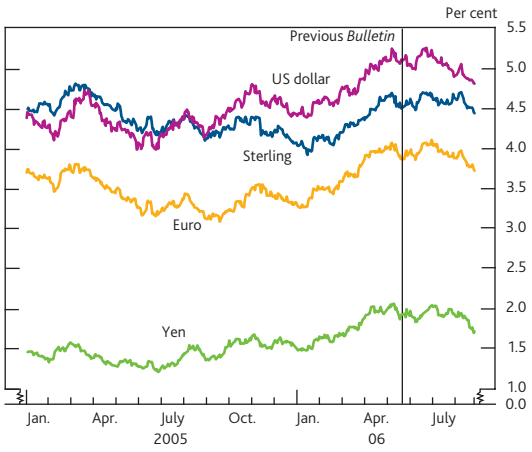
Source: Bloomberg.

Chart 5 Cumulative changes in exchange rate indices



Relatedly, the temporary increase in market volatility appeared to prompt a short-lived 'flight to quality' as investors reduced their positions in risky assets and switched to safer instruments. Perhaps reflecting this, government bond yields fell somewhat as volatility spiked. They then declined further during July and August (**Chart 6**), largely accounted for by falls in long-term real interest rates.

Chart 6 International ten-year nominal spot rates[a]

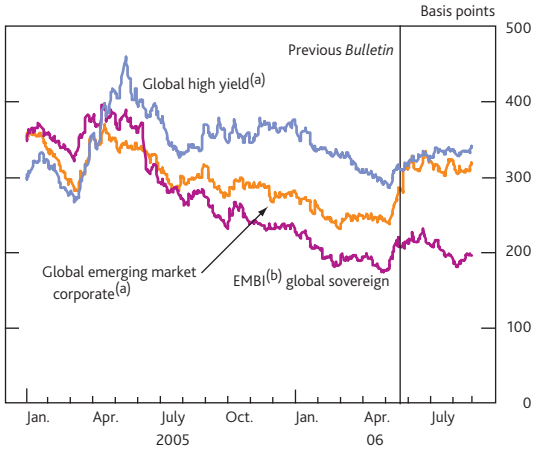


(a) Spot rates derived from the Bank's government liability curves.

Yields on EME bonds rose and EME spreads to US Treasuries widened during May and June. Spreads on sovereign EME bonds subsequently narrowed and returned close to the historically low levels reached earlier in the year, whereas spreads on EME corporate bonds remained wider (**Chart 7**).

In contrast to EME markets, industrial country credit markets were less affected by the period of heightened uncertainty in financial markets. Premia on major credit default swap (CDS) indices and investment-grade corporate bond spreads did widen, but only modestly (**Chart 8**). There was a more

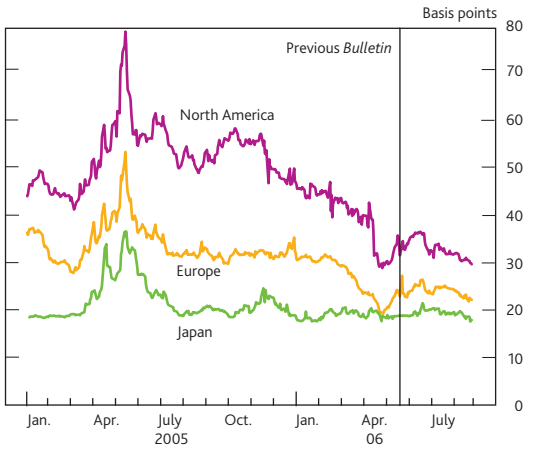
Chart 7 Emerging market and high-yield bond spreads



Sources: JPMorgan Chase & Co. and Merrill Lynch.

(a) Option-adjusted spreads.
(b) Emerging Markets Bond Index.

Chart 8 International credit default swap indices



Source: Bloomberg.

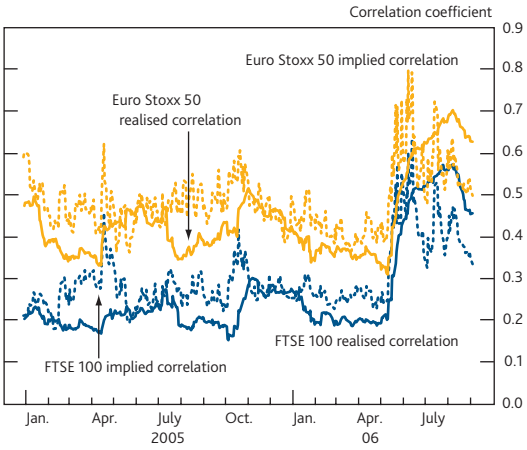
sustained widening in spreads on high-yield corporate bonds, although they remained at lower levels than were observed through most of 2005 (**Chart 7**).

Interpreting moves in global capital markets

The general pattern of developments across a number of asset markets — a sharp sell-off in May and June and a subsequent partial recovery in prices — perhaps indicates that global markets experienced a common disturbance, the effects of which were relatively short-lived. Consistent with this, realised and implied correlations within major equity indices increased significantly, before falling back (**Chart 9**). Likewise, there was a rise in the proportion of the variation in global equity, commodity and bond markets explained by a common 'principal component'(1) during May and June, consistent with a common shock (**Chart 10**). More recently, the degree of comovement in asset markets has declined suggesting greater differentiation across assets.

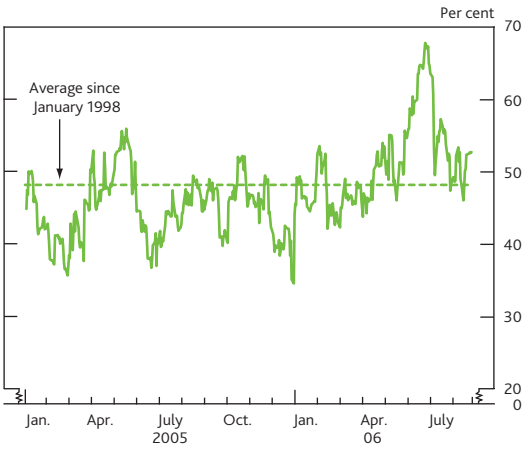
It is difficult to be categorical about the underlying trigger for the recent swings in financial markets. But the predominant

Chart 9 Implied and realised three-month correlations for FTSE 100 and Euro Stoxx 50



Source: JPMorgan Chase & Co.

Chart 10 Common component in asset prices(a)



Sources: Bloomberg and Bank calculations.

(a) Proportion of variation in global equities, emerging market equities, commodities and ten-year US Treasury yields explained by a common component over a one-month rolling window.

views among market contacts suggest a combination of three broad inter-related factors: higher official interest rates, concerns about the outlook for inflation and/or growth, and some repricing of risk.

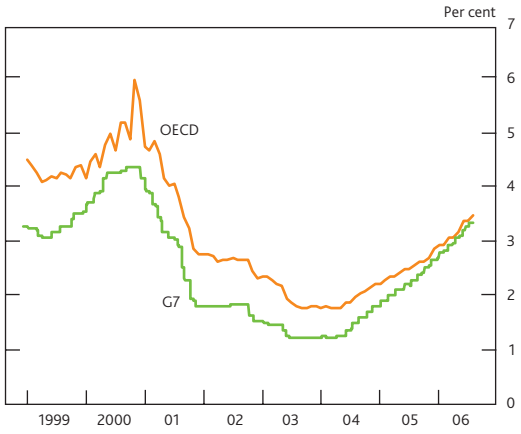
Further increases in official interest rates

A widely cited influence was the continued withdrawal of monetary accommodation globally, which may have been buoying up asset markets (**Chart 11**).(2) Sixteen of the 19 OECD central banks have increased official interest rates since late May.

In Japan, the ending of the zero interest rate policy resulted in a sharp fall in the level of current account deposits held by

(1) Principal component analysis is a statistical technique that can be used to simplify correlation matrices so that only the most important sources of information are retained. For an introduction, see Jackson, J (1991), *A users guide to principal components*, John Wiley & Sons.
(2) See box in February 2006 *Inflation Report* for a description of how excess global liquidity might stimulate demand for financial assets.

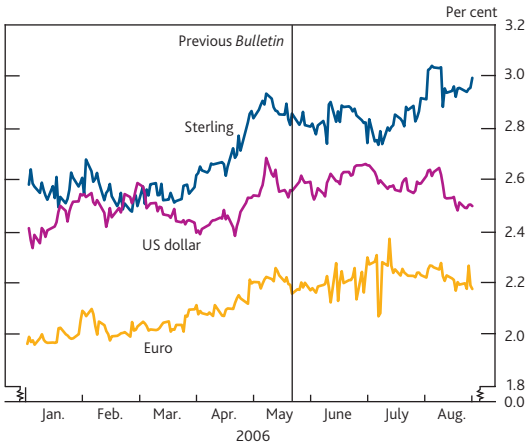
Chart 11 International official interest rates[a]



Sources: Bloomberg, IMF and OECD.

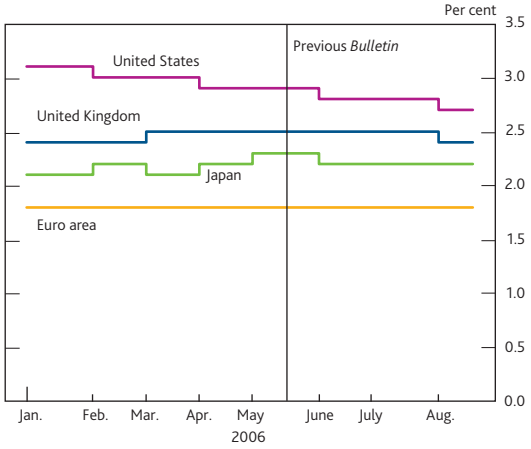
(a) The series for both the OECD and G7 are weighted averages of official interest rates. The weights reflect the relative size of each economy in the two country groupings, based on nominal GDP levels in US dollars for 2005.

Chart 12 International two-year inflation forward rates[a]



(a) Instantaneous forward rates. Dollar rates derived from the Bank's government liability curve. Sterling and euro rates derived from inflation swaps rates. Dollar rates are based on a $2^{1}/_{2}$-year forward rate. Sterling rates referenced to RPI, dollar rates referenced to CPI and euro-area rates referenced to HICP.

Chart 13 Expected real GDP growth for 2007



Source: Consensus Economics.

commercial banks at the Bank of Japan. Some commentators argued that this was a catalyst for asset price corrections as so-called 'carry trades', involving borrowing in yen at a zero interest rate to invest in other assets, were unwound. More recently, anecdotal evidence suggests that many 'carry trade' positions may have been re-established, perhaps reflecting revisions to market participants' expectations about the pace of future policy tightening in Japan.

More generally, the increases in international official interest rates have raised the cost of very short-term borrowing. However, it is more difficult to measure the amount of global liquidity and different measures give conflicting signals. In some economies there are signs of a slowing in aggregate money growth, but not universally; and many companies and institutional investors around the world have maintained large liquid asset holdings.

Investor concerns about global inflation and/or growth

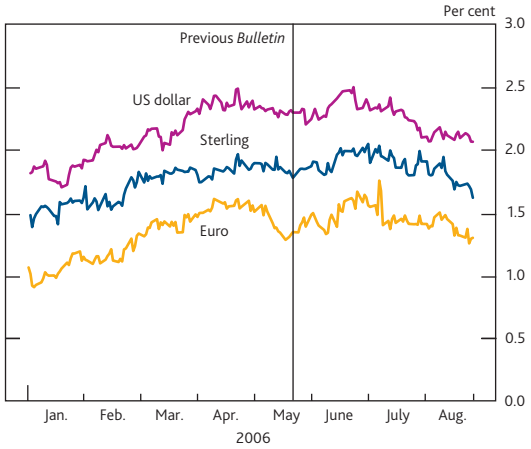
A number of commentators have highlighted the recent pickup in consumer price inflation in many countries, which at least partly reflected the pass-through of high energy and other commodity prices. Consistent with higher inflation expectations and/or inflation risk premia, short-term inflation rates implied by the difference between yields on conventional and index-linked government debt have risen since the start of the year (**Chart 12**).

It is possible that higher energy prices and the associated inflationary pressures have led market participants to revise their global growth expectations downwards, reflecting a perceived reduction in potential aggregate supply capacity and/or the expected policy response from central banks. In broad terms, some market contacts commented that concerns about the macroeconomic outlook had increased over the past six months. Heightened geopolitical tensions, the possibility of a slowdown in US consumer demand and the potential for an unwinding of global imbalances were other factors mentioned by contacts. And while recent indicators of economic activity have so far remained robust, Consensus forecasts for GDP growth in 2007 have edged lower for some economies (**Chart 13**).

Short-term implied *real* interest rates provide a read on market expectations of future central bank policy. These rose steadily earlier in the year, but drifted slightly lower from around the beginning of July (**Chart 14**). This may have reflected downward revisions to expectations about future official rates in the face of a possible perceived weakening in future economic growth.

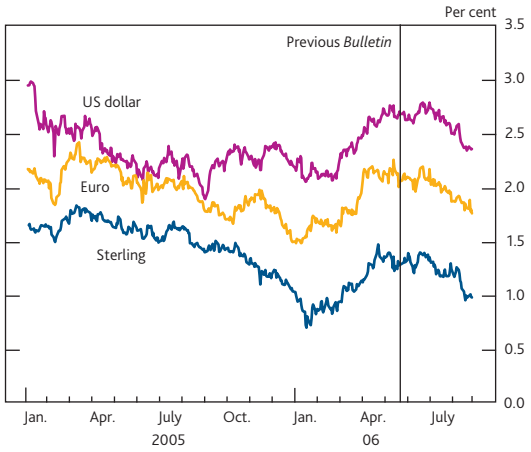
At longer horizons, real forward rates also fell over recent months, partly reversing some of the increases earlier in the year (**Chart 15**). As highlighted in the previous *Bulletin*, movements in nominal short-term and long-term real interest rates have been highly correlated over the past few years. So market participants could have edged down their expectations

Chart 14 International two-year real forward rates[a]



(a) Instantaneous forward rates. Real component of euro and sterling rates implied by nominal government bond yields less inflation swap rates. Dollar real rates derived from the Bank's government liability curves. Dollar rates are based on a $2^{1}/_{2}$-year forward rate. Rates may not be directly comparable — sterling rates referenced to RPI, dollar rates referenced to CPI and euro-area rates to HICP.

Chart 15 International ten-year real forward rates[a]



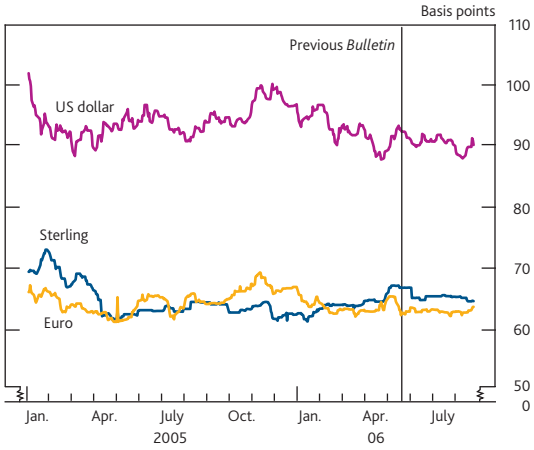
(a) Real component of euro rates implied by nominal government bond yields less inflation swap rates. Sterling and dollar instantaneous forward rates derived from the Bank's government liability curves. Dollar rates are nine-year forward rates. Rates may not be directly comparable — sterling rates referenced to RPI, dollar rates referenced to CPI and euro-area rates to HICP.

of long-run equilibrium real rates based on recent developments in short-term rates.

The falls in long-horizon real forward rates could have reflected a shift in the balance of expected future savings and investment. Perhaps related to this, market contacts have continued to cite demand from institutional investors (such as pension funds) seeking to increase the duration of their assets as an influence on long bond yields. In addition, market contacts have highlighted renewed interest from Asian investors, particularly central banks, in buying longer-dated government bonds, after a period when their new investments were reportedly concentrated at short maturities.

Another possible explanation for lower long-horizon real interest rates is that real term premia — ie compensation for uncertainty about future short-term real rates — have changed.(1) Information from long-dated swaptions suggests

Chart 16 International swaption implied volatility (five-year volatility, five years forward)



Source: JPMorgan Chase & Co.

that investors' perceptions of uncertainty surrounding long-term interest rates has not changed markedly (**Chart 16**). However, discussions with market contacts suggest, if anything, they have become more uncertain about the global macroeconomic outlook over the past few months.

Repricing of risk

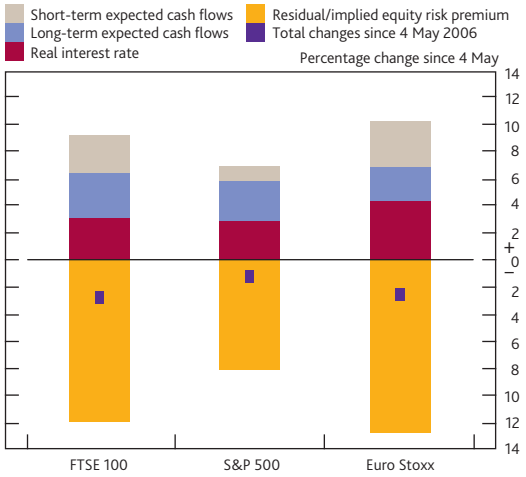
Related to this, one widely held view is that the rise in financial market volatility during May and June was prompted by an increase in the risk premia required on more speculative assets. For example, recent changes in market interest rates and survey data on earnings expectations would, other things being equal, have been expected to boost equity prices. So the observed fall in equity prices since the beginning of May implies a large unexplained residual component, which in turn might have reflected an increase in the equity risk premium (**Chart 17**).

However, any reduction in investors' desire for risk exposure seems to have been relatively modest and most concentrated among more highly leveraged investors. Proxy measures of aggregate risk appetite have fallen over recent months but they remained relatively high (**Chart 18**). The period of elevated market volatility was brief. And throughout, credit spreads remained relatively narrow and quite close to historical lows, even for low-rated debt, while flows into hedge funds increased further in 2006 Q2 (**Chart 19**). Taken together, these indicators tend to suggest that there has not been a widespread repricing of risk.

That also seems to accord with the views of market contacts, who have suggested that the increase in volatility in capital markets in May and June led some short-term leveraged investors to cut their risk positions. This was especially true of

(1) For more discussion of real term premia on government bonds see box on 'Real interest rates and macroeconomic volatility', Autumn 2005 *Bulletin*, pages 308–09.

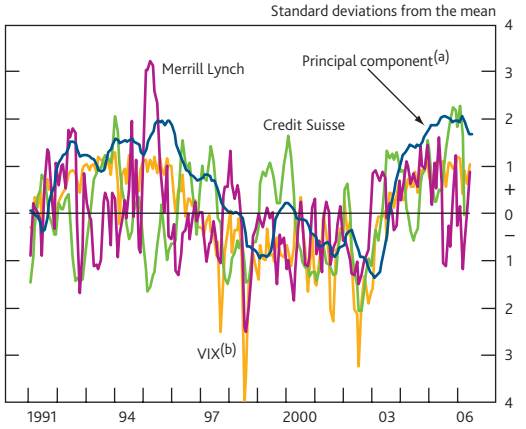
Chart 17 Decomposition of changes in equity prices[a]



Sources: Bloomberg, Thomson Financial Datastream and Bank calculations.

(a) Based on simulations of a dividend discount model. For more details of such decompositions see Panigirtzoglou, N and Scammell, R (2002), 'Analysts' earnings forecasts and equity valuations', *Bank of England Quarterly Bulletin*, Spring, pages 59–66.

Chart 18 Proxy measures of risk appetite



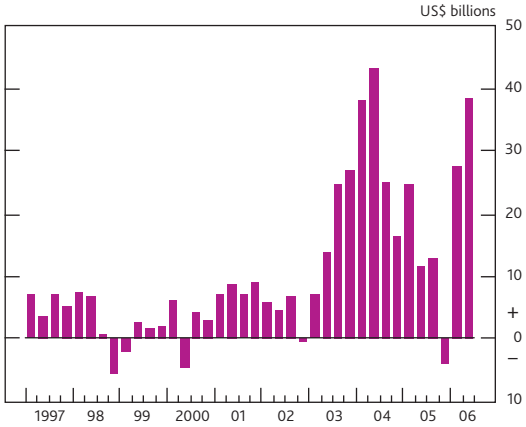
Sources: Chicago Board Options Exchange, Credit Suisse, Merrill Lynch and Bank calculations.

(a) Principal component analysis was applied to twelve-month rolling moving averages of the three individual measures of risk appetite. The blue line shows the first principal component. Qualitatively similar results were found when a wider set of risk appetite proxy measures was used, but these series were only available for shorter time periods.
(b) The VIX is an index of volatility in the S&P 500 implied from options prices. On the chart it is inverted.

their investments in EME markets, where the unwinding of carry trades may have accentuated the asset price falls. And flows into EME mutual funds — both debt and equity — fell sharply in Q2.

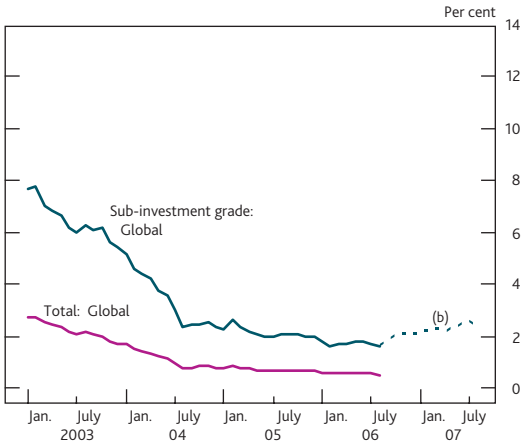
The apparent lack of a repricing of risk in credit markets may be consistent with corporate credit market indicators suggesting few obvious signs of distress. In particular, the global default rate on sub-investment grade corporate bonds has increased only marginally since May, and remained close to its lowest level since April 1997. Furthermore, forecasts by Moody's indicated that global default rates were expected to remain low for the next twelve months (**Chart 20**).

Chart 19 Quarterly flows into hedge funds



Source: Tremont Capital Management Inc.

Chart 20 Corporate bond default rates[a]



Source: Moody's Investors Service.

(a) Trailing twelve-month issuer default rates.
(b) August 2006 forecast for default rates.

The low level of expected default rates may provide one explanation for the muted impact of greater volatility in financial markets on companies' credit spreads. This is explored in more detail in the box on pages 276–77.

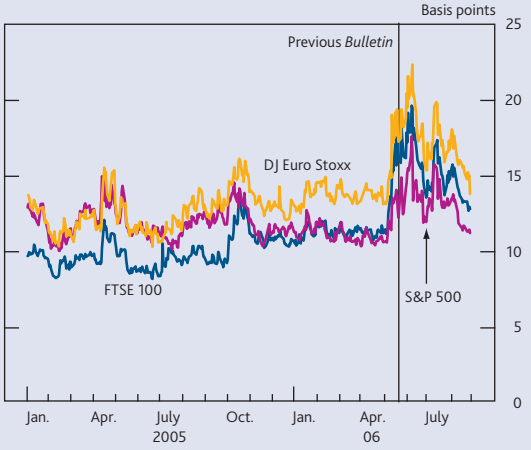
Spreads on household sector debt also changed little. In the United Kingdom, there was a small increase in spreads on the lower-rated tranches of some UK credit card asset-backed securities (ABS). That coincided with reports about high overall debt levels of UK consumers, increased personal insolvencies and slightly higher reported loan-loss provisions by some major UK banks. However, spreads on credit card ABS remained close to their historical lows. And spreads on residential mortgage-backed securities (RMBS) have generally remained narrow.

In the United States, any widening in spreads on home equity loan (HEL) ABS was also small, despite some recent signs of a possible slowdown in the US housing market and some increases in arrears on mortgage repayments.

Analysing recent moves in credit spreads using a Merton model

Equity market volatility rose sharply in May and June after a sustained period of low volatility. But there was a relatively muted reaction in credit spread indices (**Charts A** and **B**).

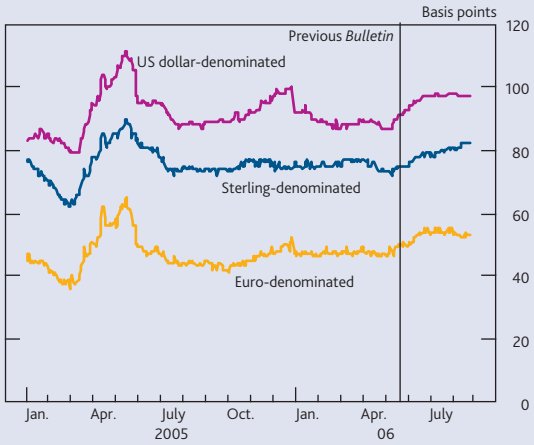
Chart A Three-month implied volatility from equity options[a]



Sources: Bank of England, CME, Eurex and Euronext.liffe.

(a) Three-month (constant maturity) implied volatilities.

Chart B Spreads on investment-grade corporate bond indices[a]



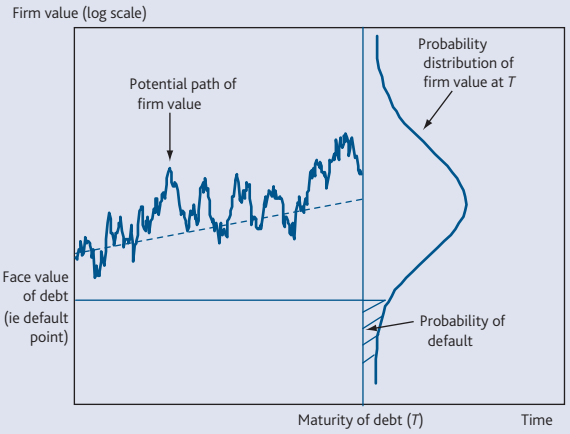
Source: Merrill Lynch.

(a) Option-adjusted spreads.

At face value, the relatively small movement in credit spreads given the size of the increase in equity volatility might seem surprising. In principle, if the rise in equity volatility reflected increased uncertainty surrounding firms' expected earnings, it should have led to a widening in the spread paid over the government's borrowing rate, reflecting an increased likelihood of firms being unable to repay debt.

A commonly used theoretical model of the relationship between the value of a firm's debt and equity is the Merton model.[1] This assumes that the underlying value of a firm is made up of debt and equity. The firm's value is assumed to follow a stochastic process, as shown in **Figure 1**. If, when the debt matures, the firm's value is greater than the face value of its debt, then the bondholder is paid in full and the equity holder receives the remaining value of the firm's assets. By contrast, if the value of the firm is less than the face value of its debt, then the firm defaults and the remaining assets are passed to the bondholder (the equity holder receives nothing).

Figure 1 Characterisation of the Merton model



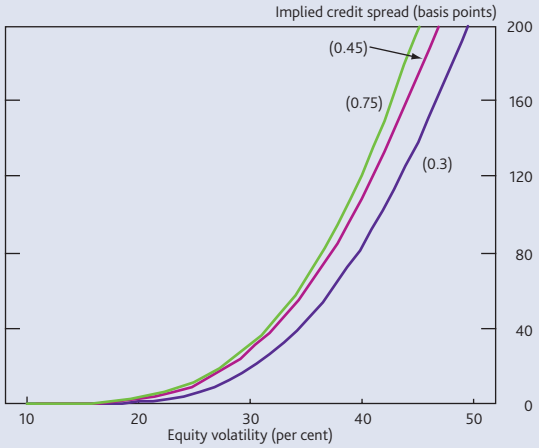
In the Merton framework, equity can be thought of as a call option on the value of the firm, with a strike price equal to the face value of its debt. Similarly, the debt provides the same pay-off as buying a risk-free bond and selling a put option on the firm value. As a consequence, debt can be priced using observed equity values and standard option-pricing formulae.[2] In turn, implied credit spreads can be derived.

The standard Merton model assumes that the volatility of a firm's value is constant. By varying the assumed level of volatility (for a given leverage), it is possible to consider the relationship between the volatility of a firm's value and its implied credit spread. Moreover, by deriving the model-implied relationship between the volatility of a firm's assets and the volatility of its equity, the relationship between credit spreads and equity volatility can be uncovered.

Chart C shows the result of such an exercise for three different leverage levels. In general, higher leverage is associated with a higher spread for a given equity volatility.[3] But even for firms with high leverage, when the level of equity volatility is low (below 20%, say) significant changes in volatility have very little impact on spreads.

Given the initially low level of equity volatility and typically healthy corporate balance sheets in early May, the Merton model would have predicted only a small reaction in credit

Chart C Credit spreads implied by the Merton model for different levels of equity volatility[a]



Source: Bank calculations.

(a) Values in brackets represent leverage ratios, ie the ratio of the present value of debt (discounted at the risk-free rate) to the value of the firm.

spreads following a permanent rise in implied equity volatility, and a fall in equity prices, of the magnitudes observed. Indeed, from trough to peak, the small observed widening in international credit spreads was actually *greater* than that suggested by the model (**Table 1**).

Table 1

	Change in implied volatility (percentage points)	Changes in spreads (basis points)	Change in implied Merton spreads (basis points)
United Kingdom	+8	+5	+3
United States	+7	+9	+1
Euro area	+9	+6	+1

Changes are maximum changes between 11 May and 14 June 2006.

The initial leverage ratios used are 0.35, 0.40 and 0.45 for the United Kingdom, euro area and the United States respectively. Although such ratios are difficult to measure precisely, these values are estimates based on available capital gearing data (to 2006 Q1 for the United Kingdom and the United States, 2005 Q4 for the euro area).

The maturity values of debt used are in line with those of the Merrill Lynch investment-grade indices: 12.7, 9.5 and 5.8 years for the United Kingdom, United States and euro area respectively.

The simple model outlined above may be insufficient to capture the complex relationship between debt and equity. But fully calibrated richer Merton-type models yield similar conclusions. For example, the model of Tudela and Young (2003),(4) which allows for early default, produces qualitatively similar results. It suggests that credit spreads on a typical UK corporate would have been predicted to increase by between 3 and 5 basis points following the recent pickup in equity volatility.

One caveat to these findings is that the composition and construction of credit and equity indices differ.(5) For example, if the observed rise in equity index volatility predominantly reflected a rise in volatility of a few companies with very low leverage but high market capitalisation, there would not be any direct link to major credit indices.

Moreover, the Merton approach may not adequately capture the dynamics of the credit market. A frequent criticism of the Merton model is that it typically predicts credit spreads that are lower than those observed. One alternative explanation for the resilience of credit markets, proposed by some market contacts, is that high demand for debt instruments from buy-and-hold investors (the so-called structured-credit bid) has helped to insulate credit markets from wider disturbances in financial markets.

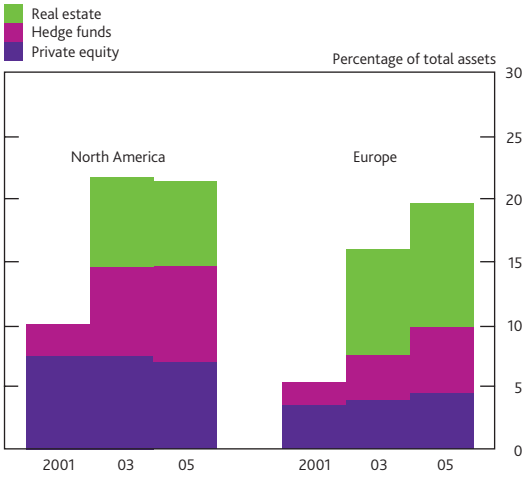
Subject to these caveats, the analysis in this box suggests that, in the context of the Merton model, an increase in equity volatility from a low level is likely to have little impact on investors' perception of the firm's ability to repay its debt. This finding is broadly consistent with market moves in May and June. The result may be particularly plausible when the increase in volatility is broad-based, rather than company or sector specific, and aggregate company balance sheets are not highly leveraged. However, as the convex relationship in **Chart C** suggests, at higher levels of equity volatility the changes in credit spreads would become increasingly pronounced for similar percentage point changes in equity volatility.

(1) See Merton, R C (1974), 'The pricing of corporate debt: the risk structure of interest rates', *Journal of Finance*, Vol. 29, No. 2, May, pages 449–70.
(2) In particular, the Black-Scholes option-pricing formula can be used. For more detail, see Black, F and Scholes, M (1973), 'The pricing of options and corporate liabilities', *Journal of Political Economy*, Vol. 81, pages 637–59.
(3) For very highly leveraged firms (eg where debt is 90% of overall firm value or more) this relationship may not hold. As debt levels become very high, the increased likelihood of default is offset by low firm-value volatility. Credit spreads are, however, always increasing in firm-value volatility.
(4) 'A Merton-model approach to assessing the default risk of UK public companies', *Bank of England Working Paper no. 194*.
(5) Equity indices are weighted by market capitalisation whereas bond spread indices are weighted by outstanding debt and credit derivative indices are equally weighted.

Recent trends in investors' asset allocations

Notwithstanding the partial recovery in major asset markets, many asset managers have suggested that the relatively high level of returns on traditional risky assets over the past few years is unlikely to continue. This has encouraged continued interest in so-called 'alternative' asset classes in the pursuit of higher returns and/or increased diversification. Survey data suggest that investment in such asset classes has increased over recent years (**Chart 21**). In particular, hedge funds have become a more important element in the asset portfolios of pension funds and life insurance companies. Arguably, hedge funds are not an independent asset class since the funds invest in other assets. Instead, benefits to investors depend on the ability of hedge fund managers to employ dynamic investment strategies and/or to use derivatives to short-sell assets and increase leverage. Academic studies on hedge fund performance suggest that the inclusion of such funds in a balanced investment portfolio can potentially reduce portfolio risk and enhance overall returns, although different studies have not always produced consistent results.(1)

Chart 21 Allocations to alternative investments by large institutional investors

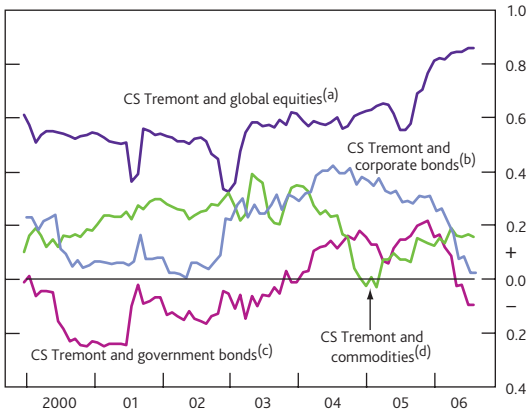


Source: Russell Investment Group.

However, unlike traditional asset classes, the development of reliable models of hedge fund returns, which are an important element in assessing optimal portfolios, has proved difficult for investors. Hedge fund strategies, which sometimes employ a multitude of complex products, are difficult to capture using standard finance models. Moreover, the absence of a sufficiently long historical record of actual returns, and how these were achieved, further complicates modelling long-term risk and return parameters.

Recent events have also shown that investing in hedge funds may not always provide the assumed diversification benefits. Many funds reported significant losses in May and continued to lose money in June. And the correlation of hedge fund index returns with returns on equities and commodities would appear to have increased in 2006 compared with 2005 (**Chart 22**).

Chart 22 Rolling three-year correlation of monthly returns on hedge funds and other assets



Sources: Bloomberg and Credit Suisse Tremont.

(a) Morgan Stanley Capital International global equity index.
(b) Merrill Lynch Global Broad Market Corporate Index, total return index in common currency.
(c) JPMorgan Chase Government Bond Index (Global), total return hedged in common currency.
(d) Goldman Sachs Commodity Index (total return).

Contacts have also reported institutional investors increasing asset allocations toward investments such as private equity, emerging markets and commodities. And a number of large UK pension schemes have announced their intentions to invest a larger proportion of their funds in commodities. In part, this move may be motivated by a desire to increase diversification and/or to provide a hedge against inflation. Historically, on average over long periods, returns from commodities investments have tended to be positively correlated with inflation and negatively correlated with equity and bond returns (**Table A**).

Table A Correlation of commodity futures returns(a) with equity returns, government bond returns and inflation (1973–2006)

	Equities(b)	Bonds(c)	Inflation(d)
Monthly	0.00	-0.13	0.12
Quarterly	-0.17	-0.30	0.25
One-year	-0.17	-0.59	0.22

Sources: Bloomberg, Thomson Financial Datastream and Bank calculations.

(a) Reuters Jefferies-Commodity Research Bureau index.
(b) Returns on S&P 500 index.
(c) Returns on Lehman Brothers US Aggregate Government Bond Index.
(d) US CPI inflation.

But events in May and June showed that returns from commodities do not always covary negatively with other assets, so the desired diversification gains may not always be realised. Furthermore, investors with equity market exposure

(1) For example, Martellini, L and Ziemann, V (2005), 'The benefits of hedge funds in asset liability management', *EDHEC Risk and Asset Management Research Centre publication*, September, found that hedge funds' ability to diversify traditional asset portfolios both in terms of a reduction in the variance of the distribution of portfolio returns as well as its kurtosis is robust. But the benefits in terms of increased expected returns and skewness are less stable through time. In contrast, Amin, G and Kat, H (2002), 'Diversification and yield enhancement', *Alternative Investment Research Centre Working Paper no. 0008* showed that the inclusion of hedge funds may significantly improve a portfolio's mean-variance characteristics, but it can also be expected to lead to significantly lower skewness as well as higher kurtosis.

may already have significant indirect exposure to commodities through holdings of shares in oil and mining companies (either directly or via equity indices). In turn, this could dilute any potential diversification benefits. And, as explained in the box on pages 280–81, some market contacts have noted that the recent increase in institutional investment in commodities may itself have bid up prices, lowering expected future returns.

Market participants have increasingly reported interest in pension fund strategies that invest passively a large proportion of assets in some benchmark portfolio while actively investing the remainder in a wide range of less conventional assets to provide additional returns (the so-called 'alpha'). Contacts differ in their views about the size of these flows, although it is reported that funds with the largest deficits have the most aggressive targets for generating additional excess returns (up to 250 basis points above their benchmark).

This type of investment strategy may have stimulated growth in benchmark products, in particular the development of vehicles such as exchange-traded funds (ETFs). A recent innovation is the development of exchange-traded notes (ETNs), which offer exposure to an asset usually by tracking a particular price index. For example, ETNs that track two popular commodity indices (the Goldman Sachs Commodity Index and Dow Jones-AIG commodity index) were introduced in June.

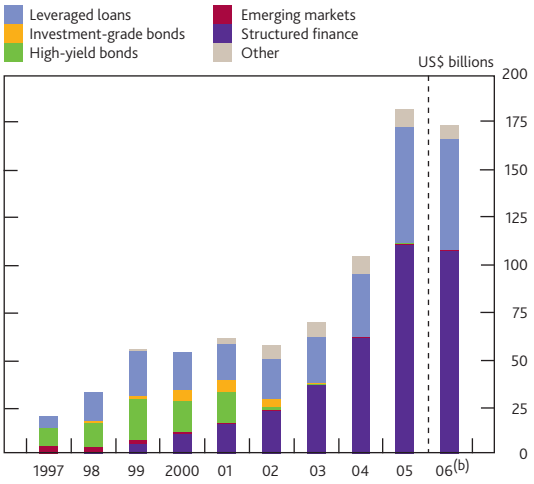
In addition to investments in commodities and hedge funds, institutional demand for exposure to credit has also remained robust, including through investments in collateralised debt obligations (CDOs). Spreads on tranches of CDOs and tradable CDS indices generally narrowed further. This in turn may have prompted some speculative investors to move into longer maturity investments, which typically have higher yields. In particular, trading activity in seven to ten-year CDS index tranches reportedly picked up. And trading in first-loss (or equity) tranches of CDOs also reportedly increased, as investors were attracted to relatively new products that package the risk as a zero-coupon bond.(1)

Issuance of CDOs has also increased further over recent months. The majority continued to be backed by leveraged loans and structured-finance or asset-backed securities (ABS), although there are signs that a greater array of underlying assets are being employed (**Chart 23**).

Credit market demand, product innovation and search for yield

Continued high demand for structured credit products backed by loans has been a key factor supporting growth in leveraged lending to finance leveraged buyouts (LBOs) of companies. Issuance of LBO leveraged loans has continued to increase strongly. Global issuance in 2006 H1 was over $200 billion, compared with less than $150 billion in each half of 2005

Chart 23 Global CDO issuance by collateral type(a)

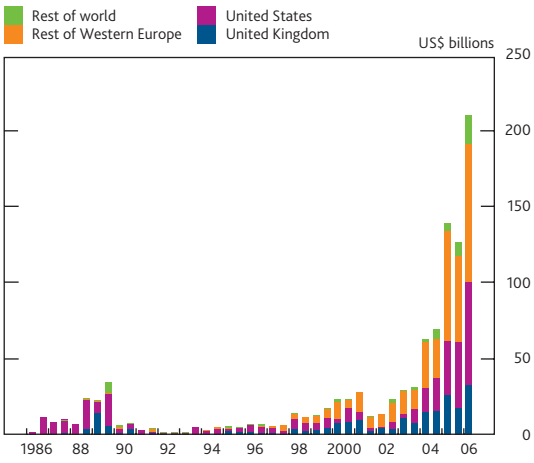


Source: Lehman Brothers.

(a) Cash flow/hybrid arbitrage CDOs.
(b) Year to August.

(**Chart 24**). Leverage multiples on deals rose further in a number of markets, with some contacts noting that arranging banks were competing on the basis of these multiples. Recent market conditions also reportedly supported raising funds through a variety of debt instruments, including mezzanine debt, second lien (ie subordinated) loans and payment in kind (PIK) notes.(2)

Chart 24 LBO loan issuance



Source: Dealogic.

Likewise, demand for ABS assets to structure CDOs backed by them may have contributed to rapid growth in the underlying ABS markets: in the United States, the ABS market (excluding CDOs) totalled over $1.6 trillion at the end of June. Strong growth also continued in Europe, particularly in the issuance of securities backed by residential and commercial mortgages

(1) In these so-called 'zero-coupon' equity products, the initial investment is deeply discounted, and at maturity the investor receives par minus any default losses affecting the underlying assets of the bespoke CDO or index. The attraction for investors appears to be the simplicity of the format and potentially high returns.
(2) A PIK security gives the issuer the option of paying investors in similar securities instead of paying interest coupons. They are generally issued by companies who value the option of conserving cash.

Investing in commodity futures

One way for investors to gain exposure to commodities without taking physical delivery is to invest in commodity futures. These are standardised contracts, traded on a futures exchange, to buy or sell some fixed amount of a commodity at a certain date in the future, at a pre-set price. Investors can purchase individual futures contracts directly or they can invest in products linked to commodity indices, the providers of which themselves tend to invest in commodity futures.(1)

Some market contacts have suggested that the recent increase in investment in commodity markets by long-term institutions such as pension funds may have contributed to changes in the shapes of futures curves. In order to understand how this might occur, it is helpful to review the theory behind commodity futures.

Understanding futures curves

The simplest theories of the futures curve suggest that commodity prices should be expected to rise over investment horizons to reflect the 'carry costs' (which include interest foregone, insurance and storage costs) involved with selling a commodity at a pre-agreed price at a future date. The existence of such carry costs means that the shape of a commodity futures curve might be expected to be upward sloping, a situation known as contango.

However, futures curves can also be downward sloping or 'backwardated'. Several theories exist to explain this. One possible explanation is that backwardation occurs due to the demand for immediate supply of the commodity. Consumers are willing to pay a premium for the physical good rather than the contract. This is typically referred to as a 'convenience yield'.

Commodities can, generally, be separated into three distinctive groups according to their convenience yield. The first group — energy and industrial metals — tend to have long supply lags and are therefore subject to supply constraints. For this reason they typically tend to be in backwardation. The second group has large above-ground stocks such as gold and some other precious metals, while the third group is agricultural commodities, where supply-side responses are relatively quick to correct market imbalances. As a result, demand constraints are likely to be less for the latter two types of commodity and thus backwardations tend to be much rarer.

Keynes(2) rationalised the existence of a convenience yield as the premium required by 'speculators' to compensate them for the risk of future price fluctuations. Specifically, speculators in commodity markets provide insurance to commodity producers who want to hedge their exposure and the convenience yield serves as compensation for this service. When overall hedging demand is net short (ie there is greater demand from producers to hedge than available supply from investors), this premium takes the form of a futures price that is below the expected future spot price.(3)

In summary, the futures price (F_t) should be a function of the current spot price (S_0) and the carry (interest foregone (r) plus insurance costs (μ) plus storage costs (ψ)) net of any convenience yield (cy). That is:

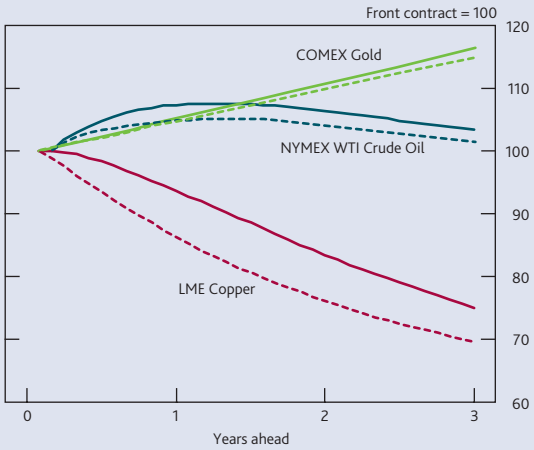
$$F_t = S_0 \cdot e^{(r_f + \mu + \psi - cy)T} \qquad (1)$$

Assuming markets are efficient, the spot price should reflect all available information. Therefore futures prices at different horizons should only move differently from the spot price to the extent that demand and supply conditions in commodity markets impact on the cost of carry or the convenience yield.

Interpreting recent developments in futures curve

Cast in this theoretical framework, the recent reported increase in demand for commodity exposure could potentially have altered the dynamics of futures pricing. In particular, the increased institutional investment may have reduced the compensation required for bearing commodity price risk. In so doing, it may have contributed to the moves towards contango/less backwardation in a number of commodity markets (**Chart A**). Put another way, if the number of investors ready to bear commodity price risk has increased significantly, the futures risk premium may have fallen (ie convenience yields may have been reduced).

Chart A Selected commodities futures curves(a)



Source: Bloomberg.

(a) Solid lines refer to prices from futures curves on 1 September 2006 with prices indexed to the front contract (ie the futures contract that is nearest to expiry). Dotted lines indicate similarly constructed futures curves on 3 January 2006.

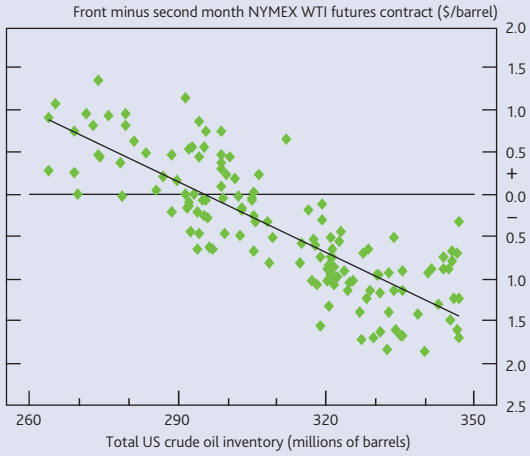
Investors tracking commodity indices typically roll underlying futures contracts as they approach their delivery date (ie they

sell the contract that is included in the index as it nears expiry and buy a contract with the same characteristic but with a longer expiration data). Some commentators have argued that the scale of demand relative to supply (according to some estimates around $100 billion may have been invested in funds tracking the main commodity indices, up from less than $20 billion three years ago) has amplified the effect of rolling, which puts downward pressure on the price of 'front-month' contracts (ie those nearest to expiry) and upward pressure on the later contracts. This might explain why the futures curves have tended to be most affected at short horizons where rolling is most active.

However, there may be other explanations behind the recent developments in commodity futures prices that are unrelated to increased institutional investment and reflect market-specific factors. For example, some market contacts have suggested the moves toward contango in oil can be attributed to change in inventory levels. And **Chart B** shows that there may indeed be a negative relationship between the slope of the oil futures curve and US crude oil inventories.

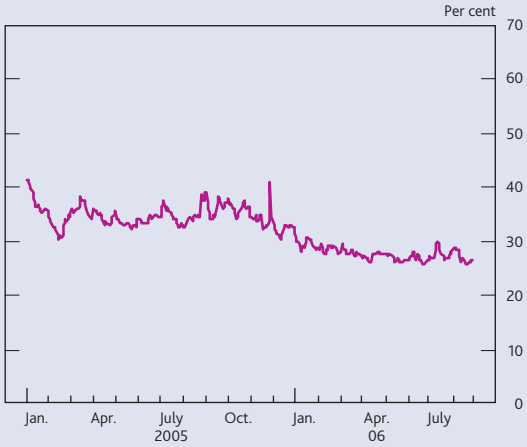
The increase in oil inventories could have reduced the uncertainty about future price fluctuations as there is more physical supply to meet immediate demand. In turn, this could have led to falls in the premia that investors demand as insurance against future price changes (ie lower convenience yields). This would be consistent with falls in implied volatility of oil prices over the past year (**Chart C**).

Chart B Oil inventory levels versus slope of oil futures curve since 2004



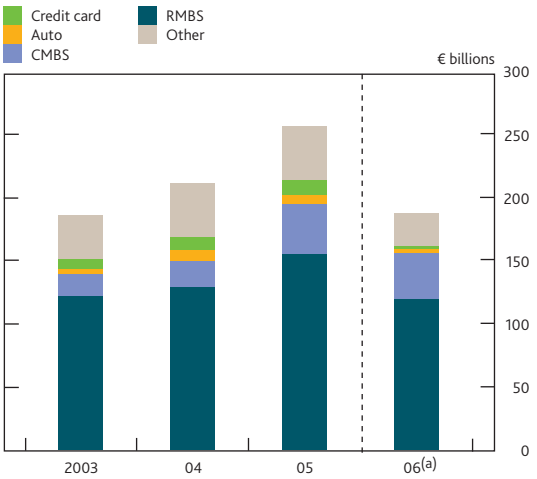
Source: Bloomberg.

Chart C Three-month implied volatility from oil options



(1) There are many commodities indices managed by different institutions including the Goldman Sachs Commodity Index (GSCI), Dow Jones-AIG commodity index and Reuters Jefferies-Commodity Research Bureau (RJ-CRB) index.
(2) Keynes, J M (1930), 'A treatise on money', *The Applied Theory of Money*, Vol. 2.
(3) This is sometimes referred to as 'normal' backwardation. Generalising Keynes' insight, Cootner, P H (1960), 'Returns to speculators: Telser vs. Keynes', *The Journal of Political Economy*, argued that the futures premium can be positive or negative depending on the sign of net demand for commodity price risk.

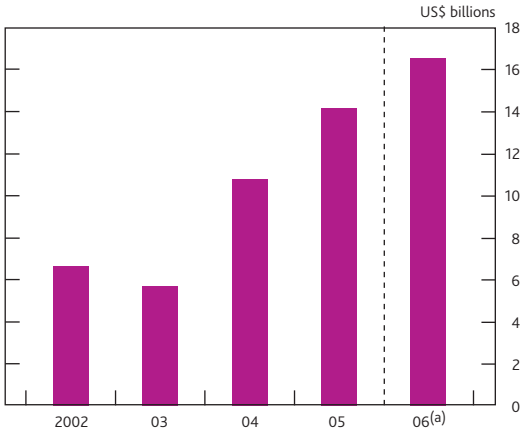
Chart 25 European ABS issuance by collateral type (excluding CDOs)



Source: Deutsche Bank.

(a) Year to August.

Chart 26 Issuance of MTNs by structured investment vehicles



Source: MTN-i.com.

(a) Year to August.

(**Chart 25**). ABS activity also picked up in non-core markets, such as Asia, Russia and South America. And there was a further increase in the variety of assets used to back such securities, such as social security payments, export credits and football stadium receipts.

Demand from asset managers to access a wider universe of assets has also fuelled the development of investment vehicles that offer a way into asset classes that would previously have been difficult for them to access. ETFs are one example, but there have also been a spate of launches of closed-end funds. These list on a stock exchange and invest their capital in a specific, often relatively illiquid, market such as private equity or real estate.

Market contacts have also reported a further broadening of the assets bought by structured investment vehicles (SIVs). SIVs are special-purpose companies that typically buy high-quality assets of longer maturities than their liabilities — mainly commercial paper or medium-term notes (MTNs) — thereby taking a view on the term structure of credit spreads, which is typically upward sloping. However, some SIVs have reportedly invested in non-investment grade securities, albeit with lower leverage. And SIV activity appears to have increased — issuance of MTNs in the eight months to August 2006 exceeded the total raised in the whole of 2005 (**Chart 26**).

Arguably, such innovations are further manifestations of the much-reported 'search for yield' and indeed, more generally, there are few signs that this has been significantly dented over recent months. As discussed in previous editions of the *Bulletin* and *Financial Stability Report*, the fact that markets have coped with a succession of potentially destabilising events — for example, the credit market 'wobble' in May 2005, the gradual removal of global monetary accommodation over the past two years and most recently the temporary spike up in asset price volatility — could suggest that the continued low level of risk premia in recent years is based on underlying fundamentals. In addition to continued macroeconomic stability, it is possible that financial product innovation and the widening of the investor base in some markets may have facilitated greater dispersion and diversification of risk and thereby contributed to greater financial market stability.

As some contacts have pointed out, there are, however, risks to this scenario. The nature and/or size of the recent disturbances may not have provided a sufficiently rigorous test of complex financial markets that have grown rapidly over recent years. And the macroeconomic environment has so far remained relatively benign. In particular, there have been few credit defaults. This may have led market participants to underestimate the potential for macroeconomic volatility going forward, perhaps because they have placed too much faith in the ability of policymakers to offset adverse shocks to the macroeconomy.

Developments in market structure

CREST settlement moves to Euroclear's Single Settlement Engine and delivery-by-value (DBV) transactions on CREST

Major aspects of settlement for UK and Irish securities in CREST moved to Euroclear's Single Settlement Engine (SSE) from 28 August. That followed the implementation of the SSE by Euroclear France on 29 May as a step towards Euroclear's objective to consolidate the Belgian, French, Dutch, UK and Irish Central Securities Depositories, and Euroclear Bank onto a single platform.

In the days following the transfer, communication issues between CREST and the SSE caused UK settlement to be completed later than scheduled. In particular, the settlement

of delivery-by-value (DBV) transactions at the end of the day was affected. There were consequent extensions to CHAPS settlement and to the availability of the Bank's standing facilities (the standing facilities are a key element of the Bank's new framework for its operations in the sterling money markets, as discussed in the next section). Over a ten-day period, CRESTCo progressively improved the settlement timetable and restored it to normal.

DBVs are overnight collateral deliveries in CREST used to settle repos and securities loans where the intention is to deliver a basket of collateral rather than specific securities. The function allows those delivering collateral to specify the value to be delivered rather than specific securities. The CREST system then picks suitable securities from their account for delivery according to a predetermined algorithm.

Very large values (around £120 billion) of transactions settle via DBV each day, including a significant proportion of the Bank's repos against gilt collateral in its open market operations. Since DBV is a mechanism for overnight deliveries of collateral, term transactions (ie trades for longer maturities) are conducted as a series of forward-starting DBVs, which unwind every morning and are reinstated at the close each day. Term transactions processed in this manner increase the demand for intraday financing from both the settlement banks and the Bank, and generate operational risk from the need to reinstate the DBVs each day.

The possibility of developing a 'term DBV' facility for the UK market has been raised in the context of Euroclear's consultation on securities financing on the Single Platform. Using such a facility, DBV transactions could be kept intact during the day for term trades. The Bank is in favour of developing such a product, given the potential benefits to CREST's users and their settlement banks and indirect benefits arising from a potential reduction in risks to financial stability.

LCH plans for netting of gilt DBV repos

Use of CREST's DBV facility for settlement of gilt repo transactions may increase following LCH.Clearnet's planned extension of its gilt repo clearing service to gilt DBVs from 23 October. (Testing is scheduled to begin in September.) LCH.Clearnet's plans have been discussed at the Bank's sterling Money Market Liaison Group (MMLG) and Securities Lending and Repo Committee (SLRC) and market contacts have said it should improve liquidity in the gilt repo market at longer maturities, particularly if it facilitates netting of transactions for balance sheet reporting purposes.

Removal of Government Sponsored Enterprise daylight overdraft facility in the United States

There was also an important change in the US dollar payments systems during the review period. On 20 July, the Federal Reserve Bank of New York (FRBNY) ended the free daylight overdraft facilities previously offered to the US Government Sponsored Enterprises (GSEs), such as Fannie Mae and Freddie Mac. The GSEs had used the facilities to cover intraday mismatches between the payment of liabilities early in the day and the receipt of income from assets later in the day. On days when the GSEs made payments of interest and principal on mortgage-backed securities, these overdrafts would be very large (up to $80 billion).

The changes had previously been announced by the FRBNY in September 2004. Market contacts suggest that the change passed off smoothly with little market impact and there have been no reported difficulties during the high-volume payment days since the change.

In the sterling and euro high-value payments systems — CHAPS and TARGET — there are no intraday overdrafts of the type used in the US system (Fedwire). Instead, liquidity is provided to settlement banks within these payments systems against collateral.

Leveraged loan credit default swaps

An important development in the infrastructure supporting the credit markets has been the adoption in June 2006 of standard documentation, jointly developed by the International Swaps and Derivatives Association and the Loan Syndications and Trading Association, for credit default swaps on US leveraged loans. The European market is fine-tuning its documentation, which differs from the US model. For example, in Europe leveraged loan credit default swaps (LCDS) cancel if the underlying loan is repaid, whereas US LCDS cancel only if there are no remaining loans outstanding at the same lien (ie loans at a similar level of subordination).

LCDS were first traded about a year ago, and the market has grown to around €2.5 billion in Europe and $5 billion in the United States according to studies carried out by investment banks. Market participants suggest that an obstacle to further growth is the current imbalance between buyers and sellers (more demand to sell protection, especially from hedge funds). But liquidity may increase when two European LCDS indices are introduced by iTraxx, with a US index to follow later in the year.

Bank of England official operations(1)

The Bank's management of its balance sheet is directed to policy purposes. Changes in the Bank's assets and liabilities are related to the implementation of monetary policy through establishing the official Bank rate in the money markets; management of foreign exchange reserves; provision of banking services to other central banks; and management of

(1) This section reviews the three maintenance periods from 18 May to 2 August.

the Bank's free capital and cash ratio deposits from financial institutions.

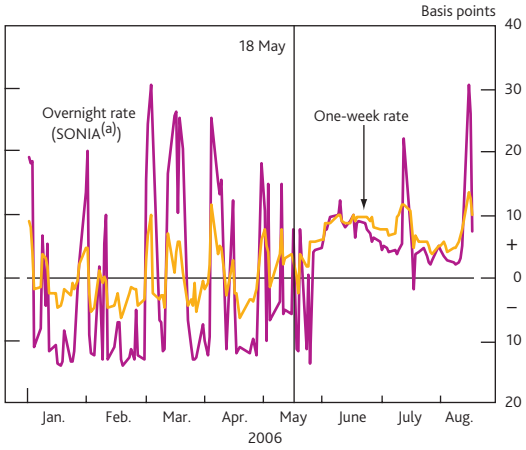
Monetary policy implementation

The introduction of the reserves scheme on 18 May, before the start of the review period, significantly increased the size of the Bank's balance sheet. However, its largest liability has remained the value of banknotes in circulation. Over the review period, the value of banknotes issued rose slightly, in line with its recent trend (**Table B**). Despite this, the overall size of the Bank's balance sheet fell, reflecting a reduction in banks' and building societies' choice of target reserve balances. The 41 reserves scheme members chose to target around £23 billion in the first maintenance period. This had been reduced to a target of £18 billion by the third maintenance period. Some banks held a higher level of reserves immediately following the launch of the new framework for precautionary reasons. But following a smooth transition and the experience of full maintenance periods, some opted to reduce targets, motivated also by the cost of financing reserves and the yields available on other liquid sterling assets.

The Bank's reserves averaging scheme is intended to smooth short-term interest rate volatility during the monthly maintenance periods such that overnight market interest rates are in line with the official Bank rate. Since the launch of the new framework, overnight unsecured interest rates have generally been close to the official Bank rate (**Chart 27**). The distribution of the spread between the sterling unsecured overnight interest rate and the official Bank rate narrowed (**Chart 28**), and day-to-day volatility of sterling overnight rates compared favourably with that of overnight rates in other currencies (**Chart 29**).

A small positive spread between the official Bank rate and unsecured interbank rates is to be expected, reflecting a premium for credit risk and the cost to the Bank's counterparties of obtaining collateral eligible for use in the Bank's short-term repo OMOs. But there were two noticeable outliers on the final working days in June and July (**Chart 27**). Market contacts suggested that the spike at the end of June reflected a reduced willingness to lend unsecured to other banks at the half-year end, which put upward pressure on unsecured market interest rates. Some banks appear to have put limits on interbank lending in order to reduce the size of their risk-weighted assets reported to regulators and published at the half-year end. It is easier for banks to reduce short-term interbank lending temporarily than other types of lending.

Chart 27 Spread of sterling unsecured market interest rates to official Bank rate



(a) Sterling overnight index average.

Secured overnight interest rates were also close to the official Bank rate and the vast majority of trades were executed within a few basis points of it (**Chart 30**). But, as with unsecured rates, there were one or two outliers, notably on 31 July. As explained in the box on page 286, this reflected a sharp fall in overnight secured rates on that day.

The effectiveness of the reserves scheme in keeping market rates in line with the official Bank rate depends on the willingness of reserve scheme members to vary their reserves balances actively in response to changes in market interest rates.

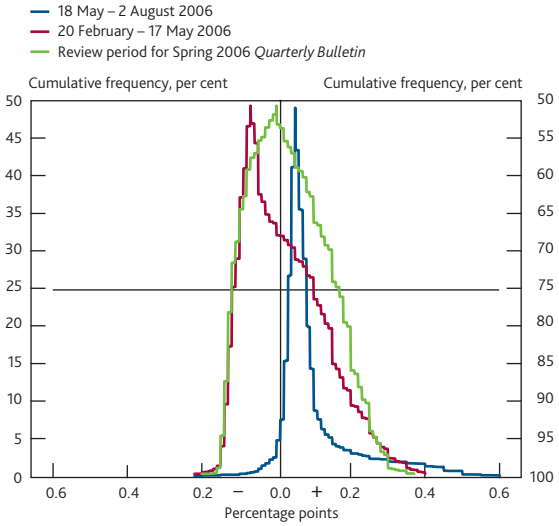
Table B Simplified version of Bank of England consolidated[(a)] balance sheet[(b)]

£ billions

Liabilities	2 Aug.	18 May	Assets	2 Aug.	18 May
Banknote issue	39	38	Short-term sterling reverse repo	34	36
Reserve account balances	21	25	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	9	Standing facility assets	0	0
Foreign currency denominated liabilities	12	14	Other sterling-denominated assets	5	4
			Foreign currency denominated assets	15	18
Total[(c)]	**82**	**86**	**Total**[(c)]	**82**	**86**

(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: 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.

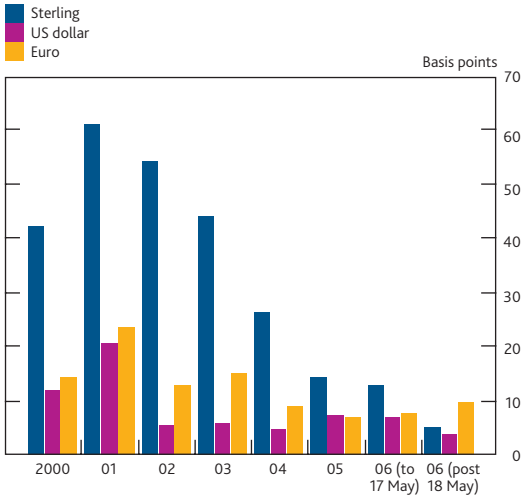
Chart 28 Cumulative folded distribution[a] of spread of sterling unsecured overnight interest rate to official Bank rate (trade weighted)



Source: Wholesale Markets Brokers' Association.

(a) The cumulative distribution function shows the percentage of trades executed at or below a given spread to the official Bank 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.

Chart 29 Spread of unsecured market interest rates to official rates[a]

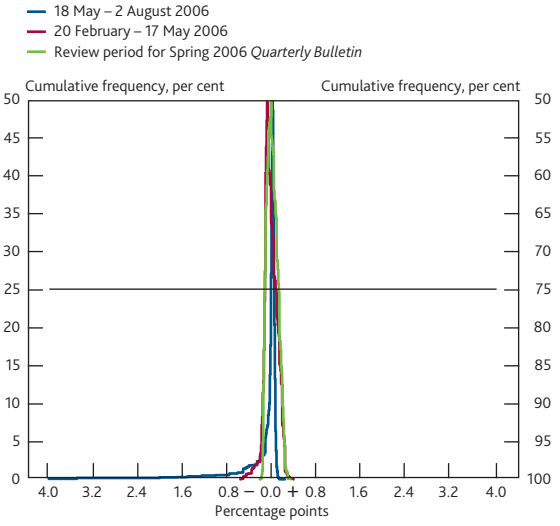


Sources: Bloomberg and Bank calculations.

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

One indication of the degree to which a bank is managing its reserves is the difference between its actual reserves balance at the end of each day and the average balance it would have needed to hold for the remainder of the maintenance period in order to hit its target exactly. **Chart 31** shows the sum of (the absolute value of) this difference across all reserves scheme members; a higher value indicates more active reserves management. It suggests significant variation in reserve balances across the system as a whole, although willingness to move actual reserves away from target differs considerably across banks.

Chart 30 Cumulative folded distribution[a] of spread of sterling secured overnight interest rate to official Bank rate (trade weighted)

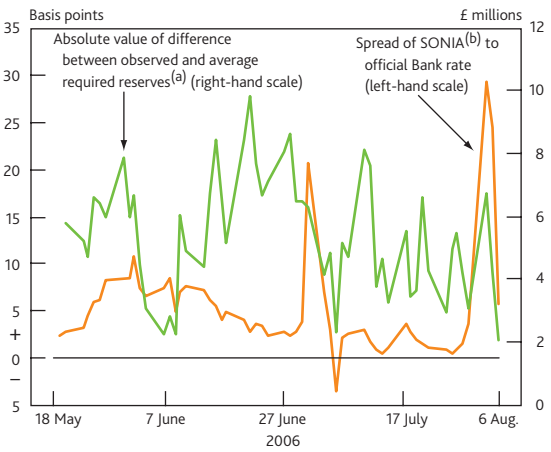


Source: BrokerTec.

(a) The cumulative distribution function shows the percentage of trades executed at or below a given spread to the official Bank 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.

To enable reserves scheme members to meet their chosen targets during each maintenance period, the Bank aims to provide through its open market operations (OMOs) the exact amount of reserves needed by the system as a whole. Reflecting lower aggregate targets in the second and third maintenance periods, the size of the weekly short-term OMOs was lower than in the first maintenance period (**Chart 32**). Cover (ratio of bids to amount to be supplied) on short-term OMOs increased steadily through the first six weeks, but edged back ahead of the half-year end and has been more stable since.

Chart 31 Reserves averaging and spread of sterling unsecured overnight market interest rate to official Bank rate



(a) The line indicates the extent to which reserve scheme members were actively managing their reserve accounts. For each day, it sums the absolute difference between each member's observed balance and the average balance it would have needed to hold in order to hit its reserve target. Higher values suggest a greater degree of active reserves management.
(b) Sterling overnight index average.

Idiosyncratic volatility in the overnight gilt repo market

On 31 July, overnight gilt repo rates (for repos against a basket of gilts) fell to very low levels, apparently reflecting a generalised scarcity of gilts in the overnight repo market. This very sharp fall in secured rates caused spreads between secured and unsecured rates to widen significantly (**Chart A**). According to market contacts, some repo trades failed to settle because counterparties were unable to obtain the necessary gilts. While the value of gilt collateral will vary over time reflecting, for example, changes in the total value of gilts outstanding, such excessive day-to-day volatility is undesirable and inconsistent with the Bank's objectives for its money market operations.

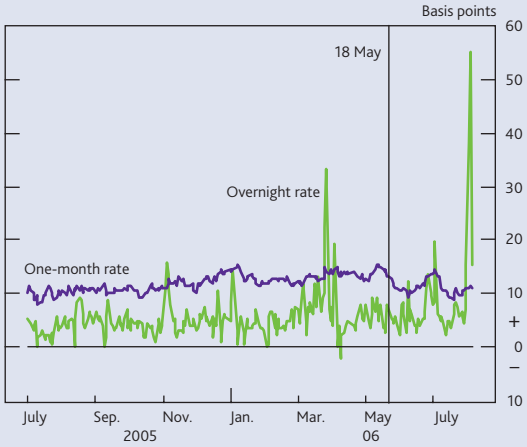
Spikes in the overnight secured-unsecured spread have occurred before and rarely persist for more than one day. Contacts suggest that, in general, shortages of gilts in the market occur largely without warning, although they have been more common around quarter and half-year ends because of the decrease in the flow of gilts into the repo market via securities lending, associated with a reduction in intermediaries' holdings of bank certificates of deposits (CDs). CDs are used extensively to collateralise loans of gilts made by long-term owners (such as pension funds and life insurance companies). Some banks and dealers seek to reduce CD holdings at year ends and half-year ends in order to lower their risk-weighted assets for regulatory reporting purposes or to reduce the size of their published balance sheets.

The fall in gilt repo rates on 31 July was more puzzling because it did not occur at a quarter-end. Market participants have suggested a number of possible alternative explanations. These include the use of gilts to collateralise borrowing of equities; a higher-than-expected allotment ratio in the Bank's routine weekly one-week repo OMO on the previous Thursday, leaving some counterparties needing to borrow collateral unexpectedly in the market; and month-end restrictions on the market activities of some banks. But none of these explanations is especially compelling — each has occurred at other times without leading to a scarcity of gilts in the overnight repo market.

One option available to the Bank's counterparties in response to a shortage of gilts in the overnight gilt repo market is to substitute euro-denominated government bonds for gilt collateral in any outstanding repos with the Bank. Until now, the Bank has generally permitted such collateral substitutions provided it was informed before 9.30 am.[1] Partly to facilitate the release of gilts into the repo market in the event of any future shortages of collateral, the Bank is intending to make changes to its operational timetable in order to allow for later substitutions of euro-denominated collateral for gilts.

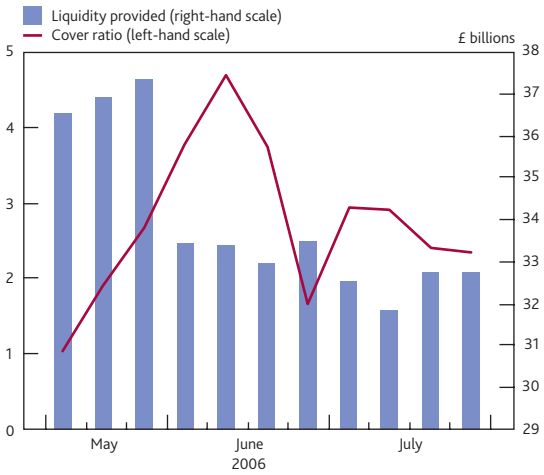
Another option available to repo market participants is to put in place arrangements with securities lenders to borrow gilts for same-day settlement against other collateral types. This is because banks, in aggregate, borrow gilts rather than own them outright so that the great majority of gilts enter the repo market through the securities lending market. Contacts say that the cut-off times for same-day settlement of gilt loans vary across lenders and depend on the collateral used. The Bank is holding meetings with gilt repo and securities lending market participants to understand better what happened on 31 July and what steps can be taken to prevent a repeat. The issues will also be discussed at the Bank's sterling Money Market Liaison Group (MMLG) and Securities Lending and Repo Committee (SLRC).

Chart A Spread between secured and unsecured market interest rates



(1) The Bank does not accept substitutions on days when it is conducting a weekly short-term repo OMO.

Chart 32 Liquidity provided in weekly operations and cover ratio



The size of each weekly OMO also varies to offset weekly changes in sterling flows across the Bank's balance sheet (such as deposits or withdrawals from customer accounts). Changes in these so-called 'autonomous factors' also feed into the Bank's routine fine-tuning OMO on the final day of each maintenance period, which ensures that the banking system's net need for central bank money is provided as precisely as possible.

Two fine-tuning OMOs were conducted over the review period (if forecasting errors are negligible, no operation is needed). The first, on 7 June, was to reduce reserves by £560 million but no offers of funds were received from counterparties. The second, on 2 August, supplied reserves of £730 million and was more than fully covered. The size of both fine-tunes was small in relation to aggregate, cumulative reserve target ranges.(1) As a consequence, reserves holders, in aggregate, ended each maintenance period well within the cumulative target range even though one of the fine-tunes was not allotted. There were no instances of a reserves scheme member ending a maintenance period outside its target range and only very limited use of the standing facilities.

The Bank introduced long-term repo OMOs in January as part of the reforms to its operations in the sterling money market. Without longer-term lending, the entire stock of financing would be rolled over in the Bank's weekly short-term OMOs. Over the review period, the Bank's long-term OMOs were fully covered and yield 'tails' were small (**Table C**). As a further step towards more efficient asset and liability management, the Bank has announced that it intends to provide longer-term finance to the banking system via outright purchases of gilts and high-quality foreign currency government bonds (with the cash flows swapped into fixed-rate sterling). More detail is provided in the box on page 288.

The introduction of the reserves scheme significantly increased the amount of funds the Bank provided to the market via its OMOs. In turn, its holdings of gilt and high-quality euro-denominated collateral has increased. The proportion of gilt collateral provided in short-term repo OMOs has changed little, whereas in long-term repos the proportion of gilt collateral has decreased (**Chart 33**).

Table C Long-term repo operations

	Three month	Six month	Nine month	Twelve month
20 June 2006				
On offer (£ millions)	1,900	750	400	200
Cover	2.85	3	2.25	2.75
Weighted average rate(a)	4.586	4.683	4.785	4.88
Highest accepted rate(a)	4.6	4.69	4.785	4.88
Lowest accepted rate(a)	4.58	4.675	4.785	4.88
Tail(b) basis points	0.6	0.8	0	0
18 July 2006				
On offer (£ millions)	1,900	750	400	200
Cover	1.85	1.6	1.63	2
Weighted average rate(a)	4.55	4.635	4.74	4.83
Highest accepted rate(a)	4.565	4.64	4.74	4.83
Lowest accepted rate(a)	4.54	4.635	4.74	4.83
Tail(b) basis points	1	0	0	0
15 August 2006				
On offer (£ millions)	1,900	750	400	200
Cover	2.22	1.6	1.38	1.75
Weighted average rate(a)	4.792	4.913	5.01	5.1
Highest accepted rate(a)	4.801	4.918	5.01	5.1
Lowest accepted rate(a)	4.781	4.91	5.01	5.1
Tail(b) basis points	1.1	0.5	0	0

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

Foreign currency reserves

As part of the monetary regime introduced in 1997, the Bank holds its own foreign exchange reserves. These assets, together with others used to facilitate participation in the euro area's TARGET payment system, have been financed by issuing foreign currency securities (euro bills, initially of three and six-month maturity, and three-year euro notes).

Under current arrangements, the Bank holds some €3.5 billion of euro-denominated assets to facilitate the United Kingdom's participation in TARGET. When the European System of Central Banks (ESCB) replaces TARGET, the Bank will not participate as a direct member of TARGET2. UK institutions will instead link to TARGET2 through access points within the euro area.(2) The changes to TARGET arrangements mean that the Bank will eventually be able to hold fewer foreign currency assets thereby reducing its need for foreign currency financing.

(1) Reserve scheme members are subject to interest penalties if, at the end of a maintenance period, their average balance falls outside a ±1% range around their chosen target.
(2) The planned changes to the euro area's payment system, including the introduction (and membership) of TARGET2, are detailed on the ECB's website www.ecb.int/paym/target/target2/html/index.en.html.

Provision of longer-term financing through outright bond purchases

As part of the new framework for implementing monetary policy, the Bank announced jointly with the Debt Management Office on 15 May that it intends to provide longer-term finance to the banking system via outright purchases of gilts and high-quality foreign currency government bonds (with the foreign currency cash flows swapped into fixed-rate sterling) as part of its routine OMOs.(1) The Bank's overall net provision of financing for the banking system will not change as a result of outright purchases of bonds. Rather provision of financing via bond purchase operations will replace part of the Bank's financing via short and long-term repos.

On 27 July 2006, the Bank issued a consultative paper on the proposed outright purchases.(2) The paper set out the background to the Bank's plans and describes the principles that will underlie the management of the resulting bond portfolio, in particular that the purchases will be simple, transparent and non-discretionary. It asked for comment on a number of specific issues related to the mechanics of those purchases. The paper also sought feedback on a proposal that the Bank should move to electronic bidding for all its OMOs, including its existing short and long-term repo operations.

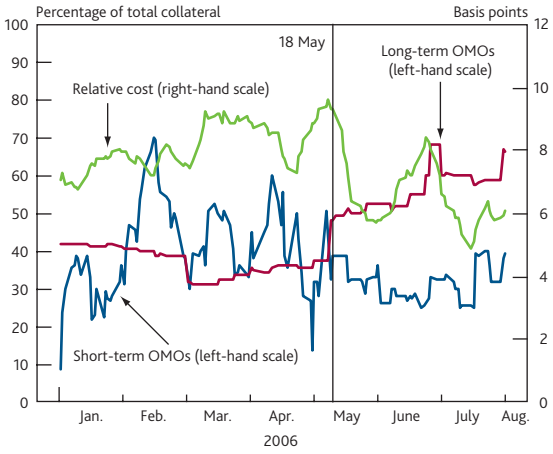
The consultative paper explains that the bond portfolio will be held as assets to back banknotes. The value of banknotes in circulation fluctuates throughout the year, owing to seasonal factors. The Bank will continue to use short-term repo lending to accommodate such temporary, seasonal variation in banknote demand.

The underlying trend has, however, been stable for many years, and so the majority of the necessary financing for banknotes can be provided via the purchase of longer-maturity assets. Purchasing a five-year bond, for example, provides central bank money to the banking system for five years (injected on the day of purchase and withdrawn on the day of maturity). Providing longer-term financing for the banking system across a range of maturities represents a more structured approach to managing the Bank's balance sheet. A number of central banks, including the FRBNY and the Bank of Japan, provide longer-term financing for the banking system's purchase of banknotes via outright purchases of government bonds.

In the light of comments on this paper, the Bank will issue in due course a further paper setting out the details for the planned bond purchases and a proposed timetable for implementation. The Bank will consult on further issues of detail (including the design of an electronic bidding system) as necessary.

(1) See www.bankofengland.co.uk/markets/money/documentation/boe_dmo.pdf.
(2) See www.bankofengland.co.uk/markets/money/documentation/consult_bond_purchases.pdf.

Chart 33 Proportion of euro-denominated collateral used in OMOs and its relative cost(a)



(a) Cost of euro-denominated collateral relative to sterling-denominated collateral is calculated as the five-day moving average of the difference between the sterling and euro secured-unsecured (one-month) interest rate spread. A higher value indicates that the relative cost of euro-denominated collateral has fallen.

The Bank announced on 24 April 2006 that its euro bill issuance programme, which provided €3.6 billion of regular financing, would cease with immediate effect. Euro bills totalling €3.3 billion have so far matured. The final euro bill, for €0.3 billion, will mature on 12 October 2006.

Capital portfolio

As set out in previous *Bulletins*,(1) the Bank holds a sterling bond portfolio of approximately the same value as its capital and reserves (net of equity holdings — in the ECB, BIS and some other companies — and the Bank's premises, property portfolio and equipment) and aggregate cash ratio deposits.

The portfolio is invested in gilts (currently around £2 billion) and other high-quality sterling-denominated debt securities (currently around £1 billion). These investments are generally held to maturity. Over the current review period, gilt purchases were made in accordance with the published screen announcements: £37.6 million of 4.75% 2020 in June, £37.6 million of 4.75% 2015 in July, and £37.6 million 4.75% 2020 in August. A screen announcement on 1 September 2006 detailed the purchases to be made over the following three months.

(1) For example, see the box entitled 'Management of the Bank's sterling bond portfolio' on page 279 of the Autumn 2004 *Bulletin*.