

## Overview: markets hit by renewed credit woes

Further deterioration in the US housing market and concerns about associated economic and financial risks continued to take centre stage during the period under review. Prices for risky assets had recovered into October, as earlier worries about systemic risk had eased, not least because of determined central bank action in the money markets. However, uncertainties about subprime and other credit market exposures remained, adding to more general concerns that US housing market woes would deepen and eventually contribute to broader economic weakness. With market participants refocusing on these risks and liquidity conditions in money markets remaining tense, sentiment worsened once again from mid-October.

Against this background, and with oil prices surging to new highs, share prices fell sharply in major equity markets. The financial sector was particularly badly hit, following a string of multibillion dollar credit-related writedowns by banks. Adding to this, third quarter year-on-year corporate earnings growth was negative in the United States for the first time in several years.

In this environment, government bond yields in major industrialised economies fell as investors again fled to safety, but also as the result of an anticipated weakening of economic activity. Heightened expectations of monetary policy easing, in particular in the United States, added to the decline in yields. Such expectations, in combination with the sharp rise in oil prices, may have contributed to rising break-even inflation rates in a number of markets.

While being drawn into more general market weakness later in the period, emerging market assets were supported by perceptions that downside risks to growth in many emerging markets would be more limited than for the major industrialised economies. Emerging market equities, in particular, outperformed their counterparts in the mature markets on assumptions of continued robust earnings growth.

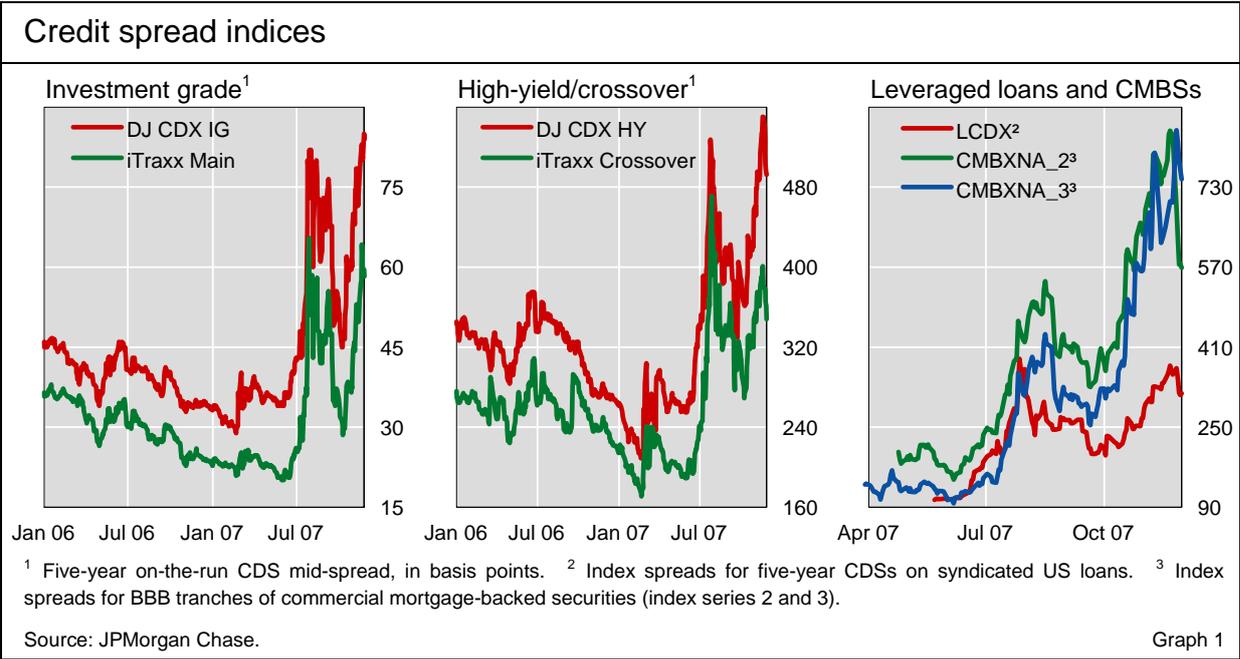
### Credit markets take centre stage once again

Credit market developments went through two distinct stages in the period from end-August to end-November, as a temporary recovery gave way to another episode of broad-based market weakness. Credit markets broadly recovered into mid-October, following repeated central bank liquidity injections into

interbank money markets and lower policy rates in the United States. However, unfavourable news about the US housing market subsequently revived earlier concerns about direct and indirect exposures to associated economic and financial risks. As a result, having reached respective low points on or around 11 October, major credit spread indices widened once again thereafter. Between end-August and 30 November, the US five-year CDX high-yield index spread rose by 85 basis points to 492, while corresponding investment grade spreads widened by 9 basis points to 76. In the process, both index spreads rose above their end-July peaks, before recovering somewhat. European indices broadly mirrored the performance of their US counterparts, widening back to 348 basis points for the iTraxx Crossover index and near 53 for investment grade spreads. At these levels, higher-yield spreads had moved somewhat above the values that have historically been associated with low current default rates, suggesting market expectations of rising default risk (Graph 1, left-hand and centre panels).

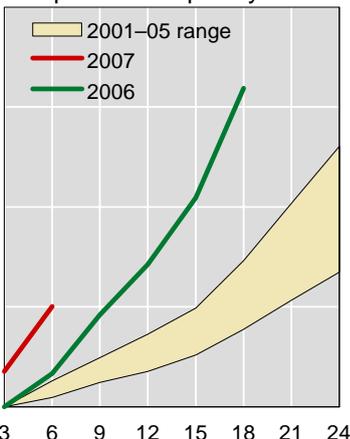
Late September, in particular, saw a broad recovery in credit markets, with the FOMC decision to cut the federal funds target by 50 basis points on 18 September triggering a strong price reaction across all market segments. Credit spreads tightened sharply, as immediate concerns about systemic risk eased. Adding to the positive sentiment, sizeable write-offs announced by major banks were at the time seen as providing much needed transparency about mortgage-related losses. Recovering markets, in turn, allowed banks to shrink their \$400 billion pipeline of leveraged loan and high-yield bond deals awaiting financing. The LCDX spread, based on credit default swaps (CDSs) written on senior secured bank loans, touched levels around 200 basis points in late September, signalling a more benign environment (Graph 1, right-hand panel). By end-October, the global backlog had reportedly been reduced to around \$245 billion, with a number of previously delayed deals – such as First Data and TXU – being relaunched and placed in the market.

Credit markets  
recover into  
October ...

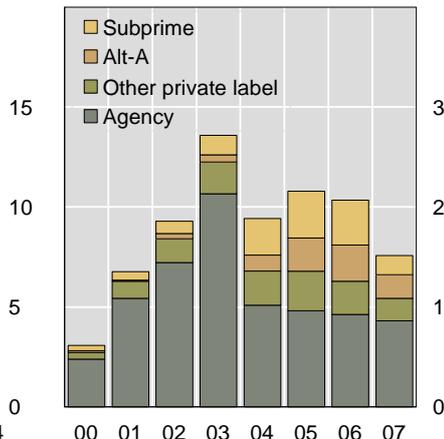


## US mortgage markets

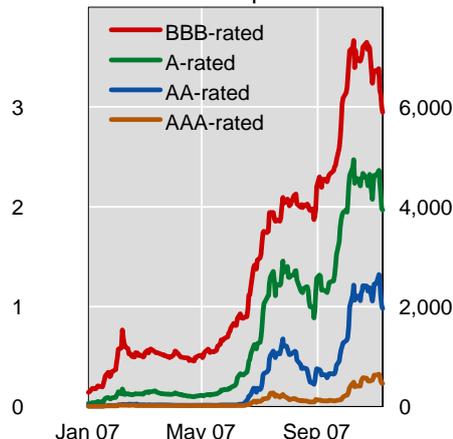
Subprime delinquency rates<sup>1</sup>



MBS issuance<sup>2</sup>



ABX tranche spreads<sup>3</sup>



<sup>1</sup> Mortgage delinquency rates (60+ days) by cohort year, in per cent. Number of months of seasoning plotted on the horizontal axis. <sup>2</sup> In trillions of US dollars; for 2007, first three quarters. <sup>3</sup> JPMorgan Chase home equity (ABX.HE 2007-1) closing on-the-run spreads, in basis points.

Sources: JPMorgan Chase; LoanPerformance; UBS.

Graph 2

... despite continuing concerns about asset quality ...

Despite this recovery, market conditions remained weak for structured instruments, which continued to be weighed down by deteriorating asset quality and uncertainties about valuation. With the origination of subprime mortgages essentially shut down, and that of other non-agency products severely curtailed, net issuance of jumbo prime and Alt-A mortgage-backed securities (MBSs) was down to about \$3 billion in September. This compared dramatically to levels of about \$30 billion/month and more in 2005 and 2006. Given the large amounts of adjustable rate mortgages known to await interest rate resets in 2008, these low volumes signalled further slowing prepayments and rising delinquencies ahead – indicators that had been suggestive of rapidly deteriorating credit fundamentals for some time (Graph 2, left-hand and centre panels). Housing data added to the negative news when, on 27 September, the new home sales release saw a decline of 21% from the previous year's value.

... and weak housing data

Further subprime downgrades ...

Sentiment worsened further from mid-October, when a new wave of downgrades of mortgage bond ratings triggered a second stage of broad-based credit market weakness. Between 11 and 19 October, Moody's and Standard & Poor's each downgraded more than 2,500 subprime mortgage bonds, totalling some \$80 billion in original face value. This added to rating adjustments by Fitch on around \$18 billion worth of 2006 vintage paper on 8 October. As these downgrades included many constituents of the various ABX.HE indices, ABX spreads widened significantly on the news (Graph 2, right-hand panel). This occurred despite the fact that the downgrades had been widely anticipated, following weak delinquency data for ABX constituent bonds (see Box 1). In the process, the more senior tranches tended to underperform the lower-rated ones, as losses were increasingly expected to eventually push through existing subordination layers. While spreads stabilised somewhat in early November, investors in AA-rated 2006 vintage subprime collateral are estimated to have taken mark to market losses in the order of 30% between end-August and

... and mark to market losses ...

## Box 1: Subprime loss mechanics: some rough estimates

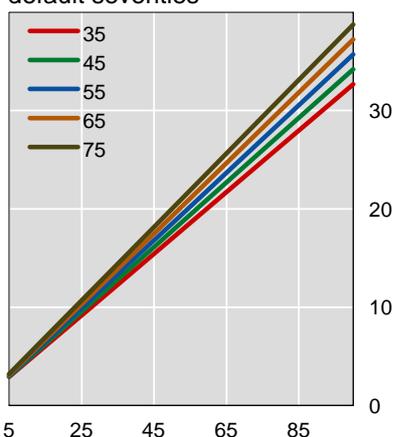
Commentators from both the public and private sectors have long voiced concerns that the rapid expansion of structured finance markets, while enhancing the ability of market participants to price and allocate risks, has also made it more difficult to track the redistribution of risks within the financial system.<sup>①</sup> Indeed, uncertainties about the size and distribution of mortgage-related losses have been among the key drivers of the broader financial market turbulence observed during the second half of 2007. This box aims to shed some light on a particular aspect of this uncertainty: the complexities introduced by the (re-)securitisation of subprime mortgage loans. For this purpose, loss projections for a pool of securities backed by home equity loans are subjected to a sensitivity analysis of key model parameters. A key result is that plausible model assumptions can generate sizeable projected losses at current delinquency levels, and that relatively modest changes in model assumptions can lead to marked increases in projected losses across different tranches of instruments with subprime exposure. This, in turn, may help to explain recent downgrade activity by the major rating agencies as well as pricing patterns for instruments such as the ABX index.

Given the degree to which subprime exposure has been securitised, mortgage market deterioration was bound ultimately to feed into ABSs and CDOs. Subprime delinquencies have been on the rise since 2005, and are expected to surpass previous peaks, especially for the most recent mortgage vintages. At the same time, there are long lags involved in the transmission of delinquencies on underlying subprime (and other) exposures to the realisation of related losses within mortgage-backed securitisations. As the foreclosure process can take more than a year to complete, and collateral pools are not usually marked to market, many recent securitisations will therefore not experience material writedowns until 2008. However, given the trends in delinquencies, markets are now focusing on the size of projected losses, and the conditions under which these are going to translate into losses on individual ABS and, eventually, CDO tranches.

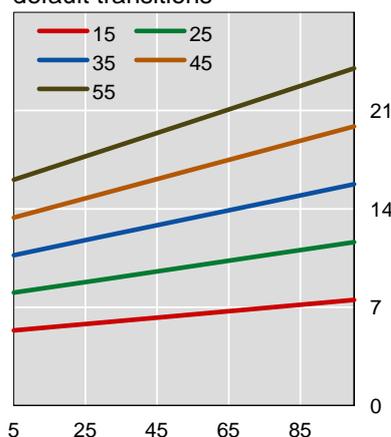
Rough estimates of subprime losses are made on the basis of simple default projections derived from November 2007 deal-level information on delinquencies and foreclosures. The asset pool used consists of the constituents of the ABX.HE 07-1 index of home equity loan securitisations. The approach proceeds in three steps. First, based on assumptions about “transitions to default” of delinquent loans (ie, about the percentage of current delinquencies that will lead to foreclosure events or worse), deal-level information is turned into projected defaults from current delinquencies. Second, these projections are mapped into default timing data on the basis of historical relationships between the average age of mortgage loans and observed percentage

### Subprime loss projections: ABX.HE 07-1 exposures<sup>1</sup>

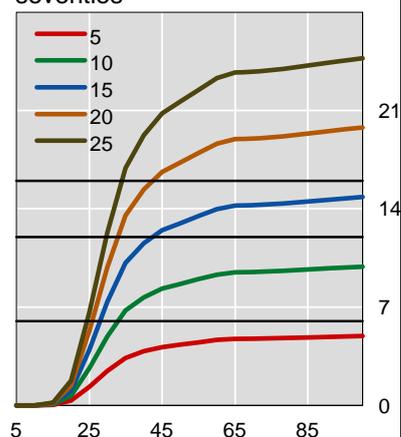
Average deal-level loss and default severities<sup>2</sup>



Average deal-level loss and default transitions<sup>3</sup>



CDO pool loss and default severities<sup>4</sup>



<sup>1</sup> As a percentage of the original balance. <sup>2</sup> Average loss (y-axis) on ABX.HE 07-1 constituents for different default severities (x-axis) and default transition assumptions. <sup>3</sup> Average loss (y-axis) on ABX.HE 07-1 constituents for different default transition rates (x-axis) and default severity assumptions. <sup>4</sup> Pool loss (y-axis) for different default severities (x-axis) and subprime collateral pool allocations; assuming a default transition rate of 65% and exposure to the individual constituents of the ABX.HE 07-1 at the 10–15% loss level. Horizontal lines mark pool losses of 6%, 12% and 16%.

Sources: Intex; Loan Performance; UBS; BIS calculations.

lifetime losses across different mortgage vintages.<sup>②</sup> Third, the resulting default projections, together with “default severity” (ie, loss-given-default) assumptions, are used to derive projected lifetime losses. To get a sense of the sensitivity of these projections to parameter changes, the default severity and transition assumptions are then varied, leading to a matrix of loss projections for different sets of assumptions.

Lifetime losses for an equally weighted portfolio of the 20 securities underlying the ABX.HE 07-1 index are projected as a function of default transitions and severities in the graph (left-hand and centre panels). Projected losses cross the 10% loss level for default severities of around 25%, and rise to more than 15% for severities of 35% and above. Historically, scenarios with low or negative house price appreciation have been associated with default transitions of 60–70%, and default severities of around 30–40%. These would suggest projected losses at 15% and above. Indeed, given the unusually weak current environment, significantly higher losses are possible and could be consistent with the large discounts from par currently being priced by ABX investors.

The same analysis can be used to illustrate the loss mechanics for hypothetical CDOs that have subprime assets as part of their collateral pool.<sup>③</sup> Loss projections for CDO pools with equally weighted exposures to the ABX constituents at the 10–15% loss level are shown in the graph (right-hand panel).<sup>④</sup> (This specification implies that ABS-level losses will affect the collateral pool only when 10% of the underlying claims have been depleted, while being capped at a loss rate of 15%; the remainder of the pool is assumed to be unimpaired). With default transitions set at 65%, projected pool loss is shown as a function of default severities and the assumed share of subprime collateral in the pool. Horizontal lines (at loss levels of 6%, 12% and 16%), in turn, give a broad indication of where BBB, A and AA-rated CDO tranches respectively might start to take losses, if assumed deal structures were to fulfil the requirements for such ratings.<sup>⑤</sup>

While hypothetical in nature, the exercise demonstrates how sensitive projected losses on CDOs can be to changes in subprime exposure and default severity. The CDO pools are projected to incur losses once default severities are around 15%, as losses push through the protection provided by subordination at the ABS level. For higher severities, projected CDO losses will ramp up further and approach the 6% level, where the most junior CDO debt tranche is assumed to be located. For low subprime exposures in the collateral pool, these junior tranches would be considered “safe” even at very high default severities. However, higher allocations to subprime assets, in combination with default severities of 30–40% (ie, for scenarios of weak house prices), can easily generate projected losses that push through assumed BBB and A-level thresholds. This sensitivity of loss projections to variation in model parameters, in turn, is consistent with the scale and magnitude of rating actions on subprime-backed securitisations observed to date and indicative of the likelihood of more downgrades were housing fundamentals to deteriorate further.

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<sup>②</sup> An important characteristic of many of these instruments is the process of “tranching”, which protects investors at the more senior level of the capital structure from losses until the more junior tranches are depleted. See CGFS, *The role of ratings in structured finance: issues and implications*, January 2005. <sup>③</sup> For this purpose, lifetime losses are defined as cumulative defaults at month 60 and timing assumptions are based on historical averages in environments of low (ie, less than 5%) house price appreciation. See UBS, “Mortgage Strategist”, 26 June 2007, for details on the projection methodology. <sup>④</sup> For tractability, a number of simplifying assumptions have to be made, limiting any direct implications of the analysis for actual CDO pools. Moody’s data suggest that CDO exposure to subprime assets has varied substantially, ranging from less than 1% to as high as 88% of total pool size. Moreover, with assets originating from 64 issuers on average and low levels of issuer concentration, subprime exposures in CDOs tend to be much more diverse than the ABX index. In addition, CDO pools would tend to be more seasoned, limiting the exposure to the most troubled mortgages. See Moody’s, “The impact of subprime residential mortgage-backed securities on Moody’s-rated structured finance CDOs: a preliminary review”, 23 March 2007. <sup>⑤</sup> This corresponds, broadly, to BBB quality, accounting for excess spread and overcollateralisation. <sup>⑥</sup> See I Fender and J Kiff, “CDO rating methodology: some thoughts on model risk and its implications”, *Journal of Credit Risk*, vol 1(3), 2005, pp 37–58.

end-November, compared to about 20% on tranches originally rated BBB. Index spreads for commercial mortgage securitisations also widened, suggesting that investors anticipated asset quality erosion to spill over from residential markets (Graph 1, right-hand panel).

Part of the renewed selling pressure in mortgage markets was explained by concerns about asset sales by structured finance CDOs and structured investment vehicles (SIVs). With more than 500 CDOs having direct exposure

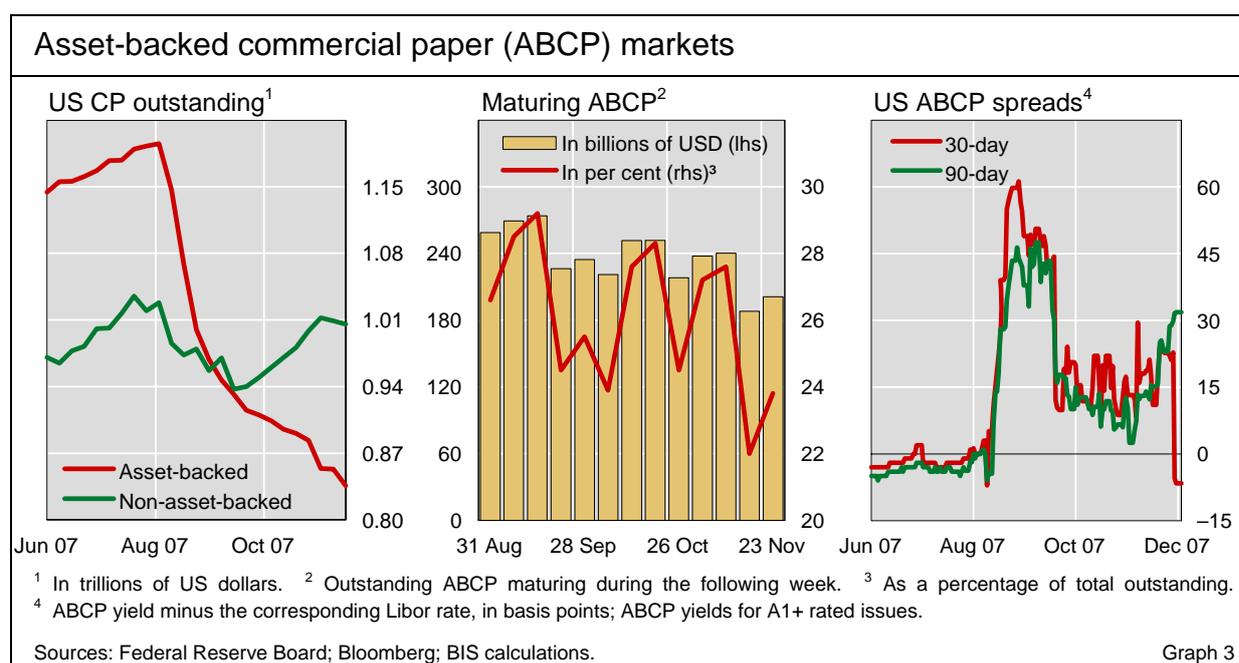
to the downgraded Moody's assets alone, ratings-related collateral haircuts were seen as possibly triggering structural provisions that give senior investors the option to liquidate the underlying collateral pool. A related problem, mark to market losses on assets held by SIVs, regained prominence on 19 October, when the failure of two SIVs to honour debt commitments led to fears of forced asset sales. This was despite signs of stabilisation in commercial paper markets more broadly, as reflected by reduced spreads on asset-backed commercial paper (ABCP) with 100% liquidity support (Graph 3, right-hand panel). At the same time, volumes declined further and the financing profile remained skewed towards short maturities of one week and less, as investors continued to have difficulties valuing ABCP collateral in an environment of largely illiquid markets (Graph 3, centre and left-hand panels).

... prompt renewed concerns about forced asset sales

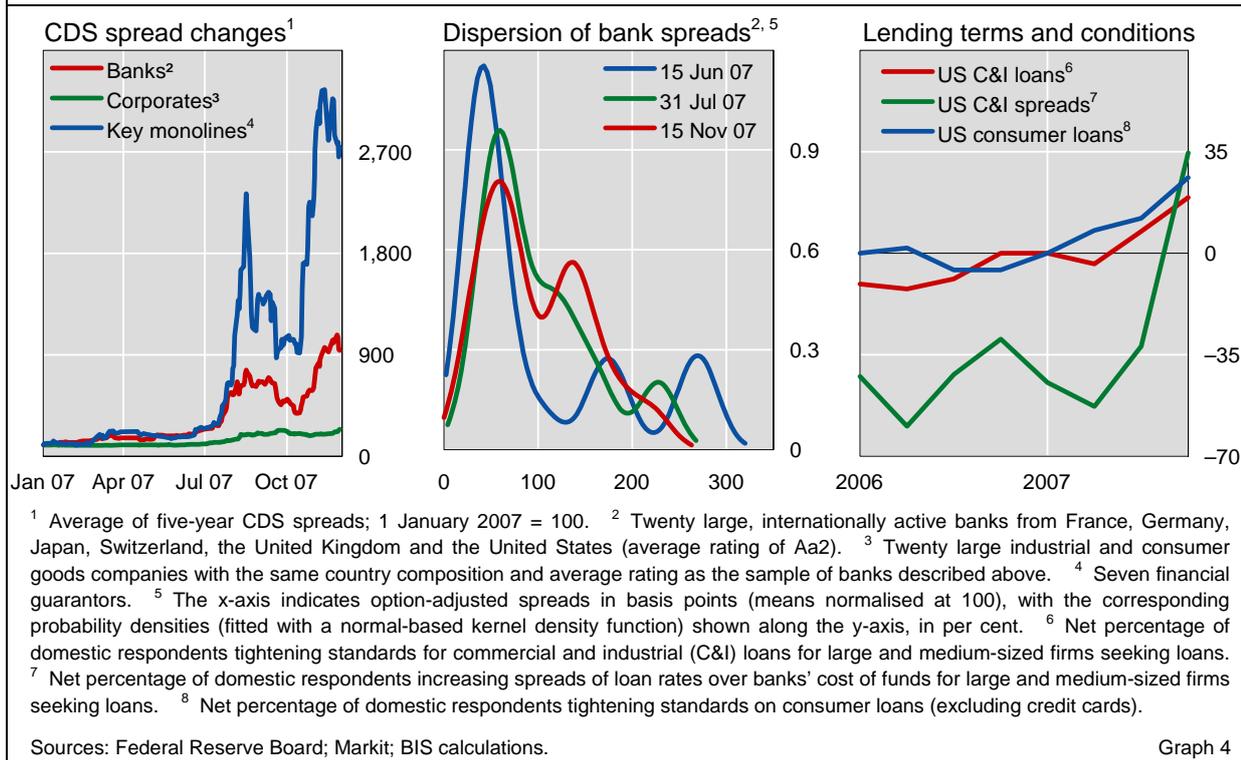
From mid-October, negative sentiment thus started once again to spill over from mortgages into the broader credit market, as investors refocused on lingering problems with exposures to risky assets. One sign of continuing uncertainty about the size and distribution of losses from such exposures was the pricing of credit protection against the default risk of banks and other financial institutions, which pointed to growing concerns about financial sector strains. Although large write-offs during the third quarter earnings season had given some initial indication of prospective losses, large-scale revisions and renewed credit market weakness suggested that more losses were about to materialise. Related concerns about banks' capital positions were compounded by further rating actions. On 23 October, Standard & Poor's lowered the ratings on 145 tranches from CDOs worth \$3.7 billion in total issuance amounts. Later the same week, Moody's downgraded 117 CDO tranches, while Fitch placed some \$37 billion in CDOs on review for possible downgrade. Further large-scale rating actions were taken during the following weeks. CDS spreads on many banks and other financial institutions thus moved substantially above the levels seen during the summer, especially for names with large securitisation

With markets refocusing on risk exposures ...

... financial sector spreads see sharp widening ...



## Financial sector spreads and lending terms



businesses or known to rely heavily on wholesale funding. At the same time, differentiation across the larger banks remained smaller than before the credit market sell-off, possibly reflecting a continuing lack of transparency about their exposures (Graph 4, left-hand and centre panels).

... fuelling concerns about further losses ...

Mortgage-related losses also started to emerge outside the banking sector. Financial guarantors, who provide external credit enhancement to mortgage-backed and other securities, were affected in particular. Widening credit spreads on senior tranches of structured instruments had resulted in mark to market losses on the value of insurance written on these products. Related fears about a possible rise in future claims thus resulted in CDS spreads on names such as Ambac and FGIC widening sharply in late October and into November. This, in turn, pointed to market concerns about impairment of even the most highly rated mortgage exposures, and to possible losses among investors in such instruments if rating changes or other events were to force writedowns on these holdings (Graph 4, left-hand panel).

... and tightening financing conditions

The underperformance of financial sector spreads continued throughout most of November, fuelled by further news about disappointing earnings and mortgage-related losses. Nevertheless, spreads recovered somewhat towards the end of the month, following high-profile capital injections in the financial sector. In contrast, spreads on corporate names did not see comparable changes in spread levels and dispersion over the period, although surveys in the euro area, the United Kingdom and the United States reported tightening lending terms for corporates and consumers. To the extent that this pointed to weaker economic growth and more limited funding availability (see the Highlights section in this issue for detail on corporate issuance activity),

spreads for lower-quality corporate borrowers could thus come under pressure going forward (Graph 4, right-hand panel).

### Bank equities hard hit by writedowns

Global equity markets largely mirrored events in credit markets during the period under review. Stock prices initially staged a broad-based recovery, with the S&P 500 Index reaching an all-time high on 9 October. However, from mid-October equities began to fall as renewed credit-related concerns again triggered worries about future profits and depressed investors' appetite for risk. A strong performance in the final week of November lifted equities off the lows reached earlier in the month. Nevertheless, between mid-October and end-November, the S&P 500 lost 4.4%, while the TOPIX index fell 7.6% and the Dow Jones EURO STOXX retreated 2.6% (Graph 5, left-hand panel).

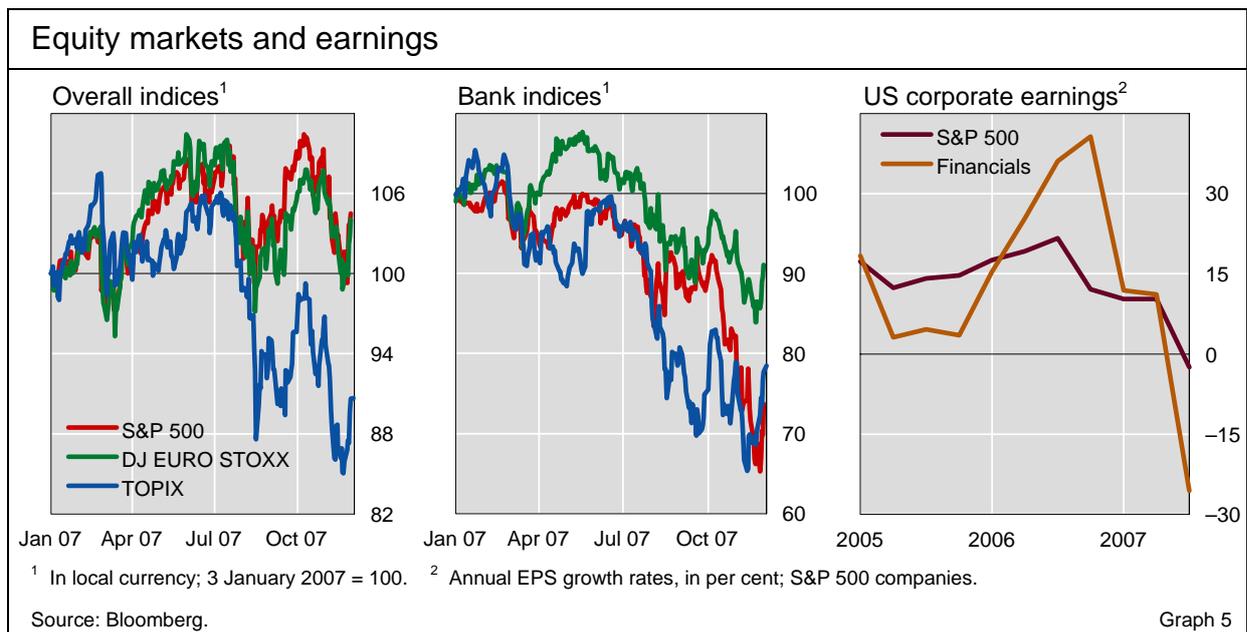
Third quarter profit growth in the United States, in particular, was substantially less buoyant than what markets had become accustomed to over the past few years, which contributed to the decline in equities. While positive US earnings surprises still outnumbered negative ones, the earnings growth expectations against which the announced earnings were measured were considerably lower than previously, implying sharply lower realised earnings as well. The average year-on-year earnings growth in the third quarter was -2.5% (on a share-weighted basis), ending a 20-quarter run of double digit increases in earnings that had averaged no less than 17% (Graph 5, right-hand panel).

Also weighing on global equity markets from the second half of October was the dismal performance of the financial sector, following a string of multibillion dollar writedowns related to structured credit products. As a consequence of such losses, banks, in particular in the United States, saw equity prices plummet (Graph 5, centre panel), and several of them experienced management shakeouts at the highest levels. Not surprisingly, third quarter earnings among US financial firms in the S&P 500 Index fell

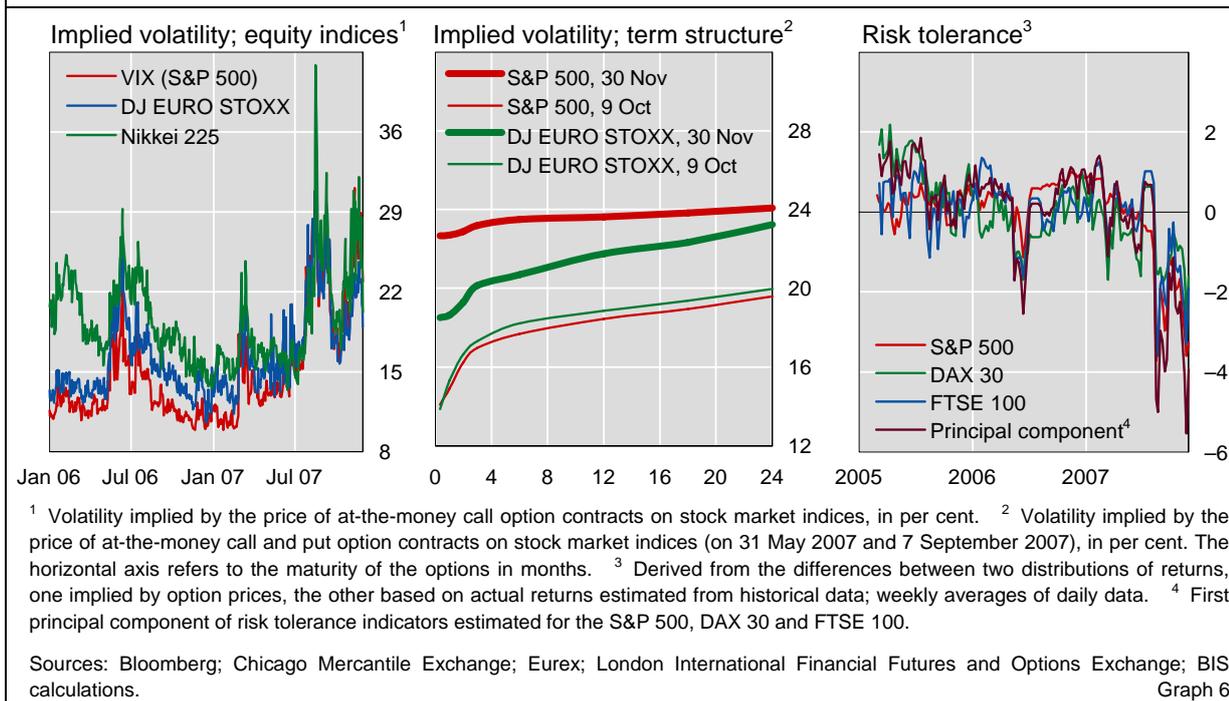
Equity prices fall on credit worries ...

... sharply lower earnings ...

... and outsized bank writedowns ...



## Equity market volatility and risk tolerance



sharply, and were considerably more negative than for the index as a whole (Graph 5, right-hand panel). The gloom was not limited to banks in the United States, as several non-US banks also reported substantial subprime-related losses. Moreover, fears among investors that the writedowns disclosed for the third quarter would turn out to represent only a fraction of what would ultimately be revealed weighed further on bank equity prices. Similar developments were observed in other parts of the financial sector. Some of the largest financial guarantors saw their equity prices drop by 40–60% in October, while US mortgage finance companies Freddie Mac and Fannie Mae lost over 40% of their equity market value between mid-October and end-November, despite some recovery in the last week of November following heightened expectations of further Fed rate cuts as well as reports of a US government-sponsored plan aimed at reducing the number of home foreclosures.

... while implied volatilities surge again

In this environment, implied volatilities again rose sharply, after having eased off their highs in August (Graph 6, left-hand panel). The S&P 500 VIX implied volatility index, which had declined to as low as 16% on 9 October, reached 31% just over one month later. This was even higher than the levels seen at the height of the first round of the credit crisis. Similar developments took place elsewhere, with one-month implied volatilities on the DJ EURO STOXX 50 Index and on the Nikkei 225 Index rising significantly in the second half of the period under review (Graph 6, left-hand panel). Moreover, the shape of implied volatility term structures as of end-November indicated that equity price volatility and associated risk premia were expected to remain elevated for some time (Graph 6, centre panel). Meanwhile, indicators of risk tolerance in equity markets fell sharply again after a brief recovery in September (Graph 6, right-hand panel).

## Bond yields fall on flight to safety and growth concerns

Yields on long-term bonds in major industrialised economies broadly reflected developments in credit and other risky asset markets during the period under review. Bond yields rose somewhat in September and early October, when conditions in financial markets appeared to improve, but subsequently fell back as market strains again became apparent and the flight to safety resumed (Graph 7, left-hand panel). As was the case during the summer months, US bond yields displayed the largest declines among the G3 economies, with 10-year Treasuries falling by almost 75 basis points between mid-October and end-November, while corresponding euro area and Japanese bond yields fell by around 30 and 25 basis points respectively.

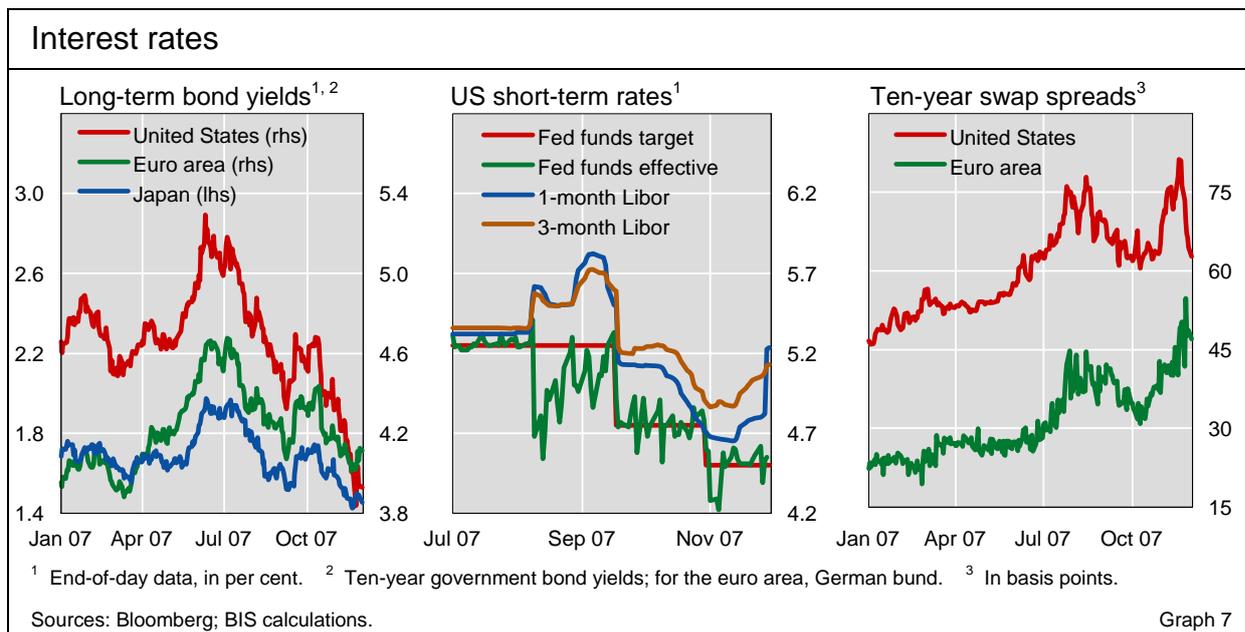
Bond yields fall ...

In money markets, which had seen severe disruptions as of early August, the situation continued to deteriorate into September, with interbank rates in most major economies, rising further from already high levels. The United Kingdom saw some of the sharpest increases in this period, as illiquidity problems at the mortgage lender Northern Rock became more and more evident, eventually triggering a bank run by worried savers. The UK Treasury's announcement on 17 September that the government would guarantee deposits in Northern Rock ended the run on the bank and appeared to contribute to easing some of the tensions in interbank markets as well.

The situation in money markets slowly improved in the second half of September and through much of October, with interbank spreads narrowing somewhat. This followed a temporary reprieve from the flow of bad credit market news, continued injections of central bank liquidity (see Box 2) and easier US monetary policy. The 50 basis point rate cut by the Federal Reserve on 18 September had a particularly large impact (Graph 7, centre panel).

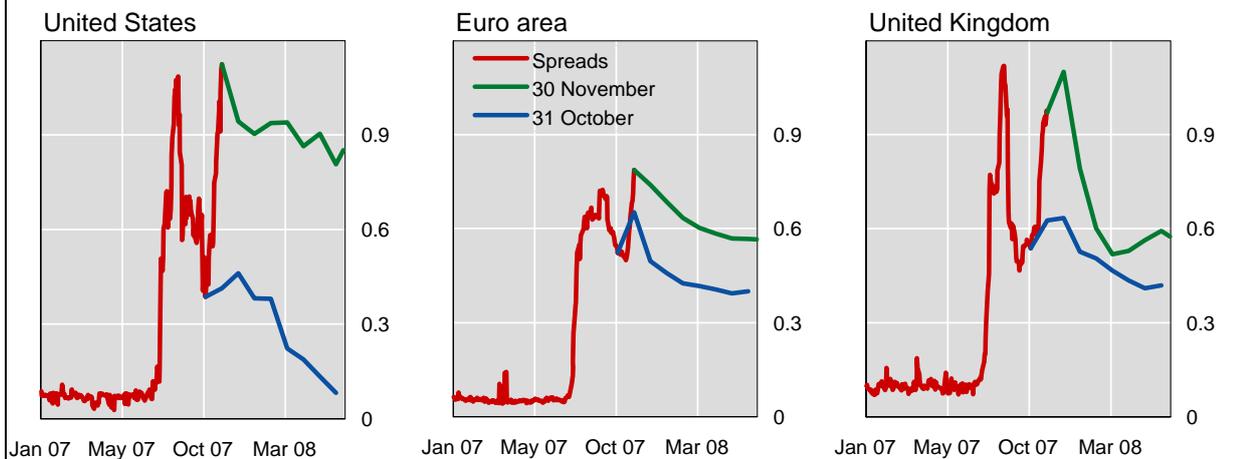
However, as bad news again began to flow in from the banking sector in mid-October and the sentiment in credit markets deteriorated, interbank money market rates rose once more. In another sign of increased nervousness, swap spreads widened considerably (Graph 7, right-hand panel), a development

... as money market strains intensify ...



## Three-month Libor-OIS spreads and implied forward spreads<sup>1</sup>

In per cent



<sup>1</sup> Three-month interbank Libor rates (for the United States, eurodollar; for the euro area, Euribor) minus corresponding overnight index swap (OIS) rates (for the euro area, EONIA swap). Forward curves display implied three-month forward spreads calculated from the term structure of Libor-OIS spreads on the indicated dates.

Sources: Bloomberg; BIS calculations.

Graph 8

which historically has been associated with heightened risk aversion and perceptions of increasing risks to the banking system. Spreads between three-month interbank interest rates and overnight index swap (OIS) rates also rose (Graph 8), indicating some combination of greater preference for liquidity and rising counterparty risk premia: interbank lending involves payment upfront whereas OIS contracts are settled on a net basis at maturity. Market concerns were particularly acute with respect to the expected liquidity situation around the turn of the year – a period when liquidity demand normally tends to be heightened and markets particularly vulnerable to illiquidity – as indicated by a sharp spike in one-month interbank rates when this maturity began to span the turn of the year (Graph 7, centre panel). However, in addition to year-end concerns, implied forward interbank-OIS spreads seemed to signal expectations of a persistent lack of liquidity and lasting concerns about counterparty risk. Such forward spreads shifted upwards for horizons extending well into 2008, and the shape of the term structure beyond the turn of the year was consistent with investors anticipating tensions to remain high in money markets for an extended period of time (Graph 8).

... and are expected to persist

Further Fed rate cuts seen as increasingly likely ...

In this environment, expectations of further policy rate cuts by the Federal Reserve strengthened in late October and in November, while expectations formed that the ECB and the Bank of Japan would remain on hold for some time (Graph 9, left-hand and centre panels). Whereas the Federal Reserve's rate cut of 50 basis points on 18 September was larger than expected, the subsequent 25 basis point reduction on 31 October was fully anticipated by markets. At the time, the FOMC statement seemed to convey a neutral message ("the upside risks to inflation roughly balance the downside risks to growth"), and the option-implied probability of the Fed remaining on hold until end-January 2008 was above 50%. However, this probability dropped quickly in

## Box 2: Central bank actions in response to the turmoil in money markets

*François-Louis Michaud and William Nelson*

Since August, several central banks in industrialised countries have taken a wide range of actions in response to the turmoil in money markets (see table), with a view to equilibrating demand and supply for central bank reserve balances at the policy rate. Demand had become elevated and more volatile since commercial banks faced more uncertain payment flows and a sharply higher cost of running short of cash. Depending on the assessment of the situation and on the operating framework, the steps taken have included changes to the size, frequency, maturity and other terms of market operations, as well as an easing of the terms on loans from standing facilities. Differences in frameworks complicate any cross-country assessment of the relative vigour of these actions.

### Steps by selected central banks to enhance liquidity since August 2007<sup>1</sup>

	RBA	BoC	ECB	BoJ	SNB	BoE	Fed
Exceptional fine-tuning (frequency, conditions)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exceptional long-term open market operations	No	No	Yes	No	Yes	Yes	Yes
Change in the standing lending facility	No	No	No	No	No	No	Yes
Expansion of eligible collateral	Yes	Yes	No	No	Yes <sup>2</sup>	Yes	Yes
Change in banks' reserve requirements	No	No	No	No	No	Yes <sup>3</sup>	No
Other change in the supply of reserves	No	No	Yes <sup>4</sup>	No	No	No	No

RBA = Reserve Bank of Australia; BoC = Bank of Canada; ECB = European Central Bank; BoJ = Bank of Japan; SNB = Swiss National Bank; BoE = Bank of England; Fed = Federal Reserve System.

<sup>1</sup> Central banks representing the most traded currencies. <sup>2</sup> Entered into effect on 1 October, not linked with the turmoil. <sup>3</sup> In September. <sup>4</sup> Since October, excess liquidity provided at the beginning of the maintenance period and drained gradually.

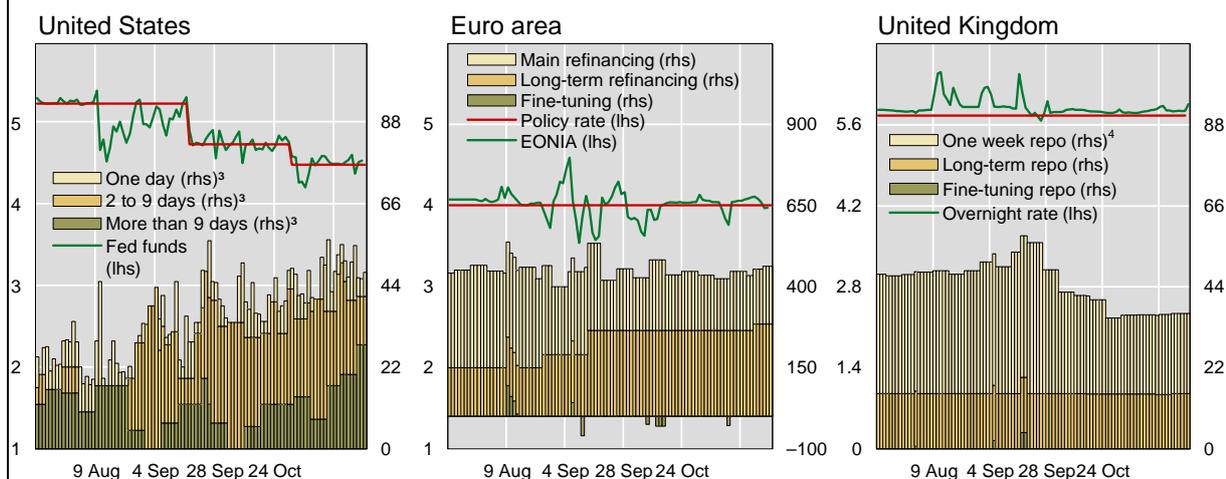
Source: Central banks.

In early August, several central banks responded to upward pressures on the overnight interest rate in their interbank markets both by temporarily injecting substantial reserves and by providing reserves more flexibly (see graph, left-hand and centre panels). The ECB conducted overnight fine-tuning operations, which in the recent past have generally occurred only about once a month, every day from 9 to 14 August. The amount of credit provided through the operations began at €95 billion but eventually declined to €8 billion. For the first operation, the ECB took the unusual step of meeting all demand at its policy rate of 4%; the other operations were conducted as regular variable rate tenders. On Friday 10 August, the Federal Reserve conducted an extraordinary three auctions of overnight repurchase agreements totalling \$38 billion, with the final auction occurring in the early afternoon. While the Fed did not change the collateral it accepts for its market operations, primary dealers on some days in mid-August provided relatively large shares of mortgage-backed securities as opposed to Treasury or agency securities. A number of other central banks, including the Reserve Bank of Australia, the Bank of Canada, the Bank of Japan and the Swiss National Bank, also conducted market operations that were either outside their regular schedule or in larger than normal amounts in response to the turmoil in August, and in some cases subsequently.

The Bank of England normally supplies reserves through market operations in an amount equal to the aggregate of the reserve targets chosen by banks at the start of each month-long maintenance period.<sup>®</sup> In September, reflecting the continued dislocation in markets, targeted reserves rose in aggregate by 6%. In addition, on 13 September, as the secured overnight rates had continued to exceed the policy rate by more than usual, the Bank expanded the aggregate amount of reserves provided by 25%. It also conducted an exceptional fine-tuning operation on 18 September, adding a further 25% of the aggregate reserve target. These additional reserves were subsequently re-offered at the scheduled weekly open market operation on 20 September.

In addition, central banks have taken a number of steps designed to address the continued shortage of funding in term money markets at maturities beyond overnight. The Federal Reserve cut the interest rate on its standing loan facility by 50 basis points on 17 August and increased the allowable term on loans from overnight to 30 days. This easing may have been intended to encourage banks to extend credit or backup lines to others. The ECB conducted exceptional long-term refinancing operations on 23 August and 12 September and has since maintained the resulting increased share of longer-term refinancing. Similarly, on 21 September, the Bank of England for the

## Outstanding central bank reverse transactions<sup>1</sup> and money market rates<sup>2</sup> in 2007



<sup>1</sup> Amounts outstanding in billions of units of local currency; provisions and absorptions denoted by a positive and a negative sign, respectively. For the United States and United Kingdom, repurchase agreements; for the euro area, refinancing and fine-tuning operations. <sup>2</sup> In per cent. <sup>3</sup> Original maturity in business days. <sup>4</sup> The decline in one-week repos reflects reserves being supplied to the market by drawings under the support facility provided to Northern Rock.

Source: National data.

first time offered repurchase agreements with three-month maturities. The four auctions did not elicit any bids, however, as term rates had already eased somewhat after the programme had been announced. Towards the end of November, in response to heightened year-end pressures on interbank rates, the Federal Reserve and the ECB decided to conduct additional term transactions with maturities extending into 2008 and announced their intention to take additional steps to keep interbank rates near their respective policy rates as needed.

Several central banks have also widened somewhat the range of eligible collateral, temporarily or permanently. The Federal Reserve, although it had already accepted asset-backed commercial paper (ABCP) as discount window collateral, began in August to accept paper for which the pledging bank provides liquidity or credit support. The Bank of Canada decided in August to accept temporarily as collateral for its market operations all securities that were already eligible for its standing liquidity facility. In September, the Reserve Bank of Australia widened the list of collateral eligible for its overnight repo facility and its discretionary operations to include ABCP and residential mortgage-backed securities. The Bank of England's three-month repurchase agreements were offered against a wider list of collateral than was applicable to the regular operations.

While the gross size of the operations increased during the turbulence, to a large extent injections of funds were reversed, in line with the average demand for reserve balances set by reserve requirement arrangements. In the United States, for instance, after spiking in one maintenance period in August, the amount of excess reserves (not shown) subsequently fell back to normal levels although repurchase agreements have increased in response to seasonal demands for cash and to offset redemptions of Treasury securities held outright. The comparative stability in the amount outstanding of refinancing operations in the euro area in part reflects the reabsorption of injections to ensure consistency with the demand set by reserve requirements.

It can be misleading to compare gross, or even cumulative net, amounts of central bank operations to gauge how far they accommodate the increased demand for reserves. For example, if the operations are of a shorter maturity, more of them will be needed to meet a given demand. Thus, although the amount of liquidity provided spiked in early August in the United States and the euro area, it was generally extended through overnight operations, which were automatically reversed the following day. Moreover, the average size of the demand can vary considerably across countries because of differences in the size of the reserve requirement. These requirements, for instance, are considerably higher in the euro area than in the United States.

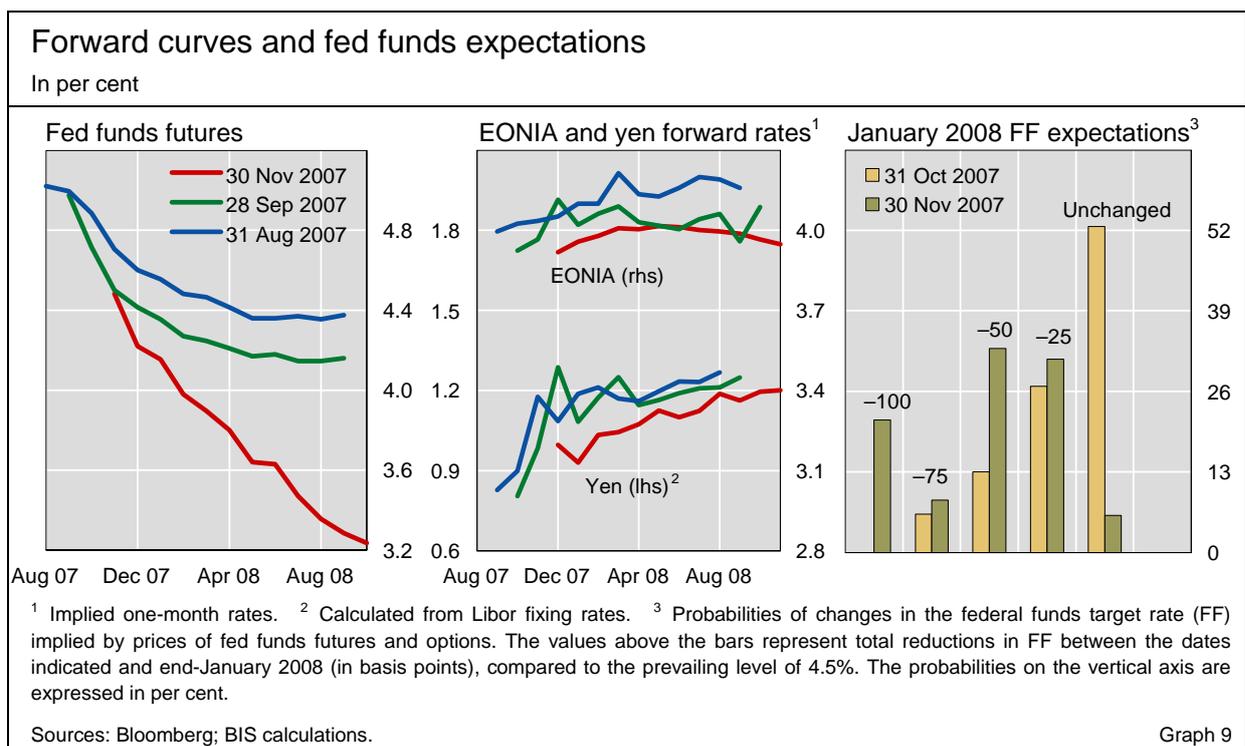
<sup>①</sup> Banks are allowed to offset deficits with surpluses in meeting a target for reserves during a "maintenance period". Outside the United Kingdom, this average target amount is generally set through a formula decided by the central bank ("reserve requirement"). See: *BIS Papers* no 9, "Comparing monetary policy operating procedures across the United States, Japan and the euro area", December 2001; Markets Committee, *Monetary policy frameworks and central bank operations*, BIS, December 2007.

the weeks following the FOMC meeting. At the end of November, by which time speeches by Federal Reserve officials pointed to the need for flexibility in determining policy rates, the option-implied probability of no rate change by end-January had fallen to around 5%, while interest rate cuts of 50 basis points or more were seen as the most likely outcome (Graph 9, right-hand panel).

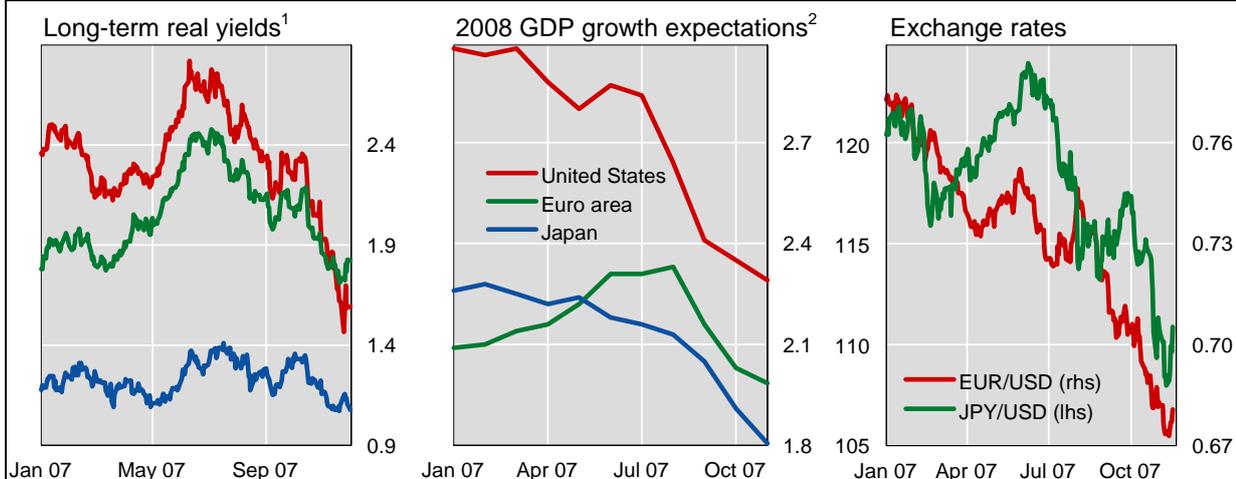
As indicated by sharp declines in real yields on index-linked bonds, expectations of further monetary policy easing were largely fuelled by fears of the fallout from the continuing financial crisis on real economic growth. With indications that consumer confidence was deteriorating significantly and profits beginning to fall, expectations of a considerable slowdown in economic activity picked up. The fact that investors saw the US economy as particularly vulnerable was reflected in the more pronounced fall in US long-term real yields: between end-August and end-November, the yield on 10-year US index-linked bonds dropped by 75 basis points, whereas yields on similar bonds in the euro area and Japan declined by around 30 and 15 basis points respectively (Graph 10, left-hand panel). Survey results among bank economists largely mirrored this observation, with expectations for 2008 real GDP growth in the United States continuing to slide despite the sharp downward revisions of earlier months (Graph 10, centre panel). Even in the euro area and Japan, where growth expectations had held up relatively well throughout the turbulent summer months, autumn survey data showed that expectations for economic activity in 2008 were significantly dented. While continued domestic economic weakness seemed to largely explain the adjustment of growth expectations in the case of Japan, the persistent financial dislocations and resulting tighter credit conditions, in combination with a falling dollar, appeared to be behind much of the downward revisions in the euro area.

... as fears of a sharp slowdown increase

The financial crisis dents the euro area growth outlook ...



## Real yields, growth expectations and exchange rates



<sup>1</sup> Ten-year yields on index-linked government bonds, in per cent; for the euro area, based on French government bonds linked to euro area inflation. <sup>2</sup> Forecasts as published monthly by Consensus Economics, in per cent; observations are positioned in the month in which the forecast was made.

Sources: Bloomberg; © Consensus Economics; national data.

Graph 10

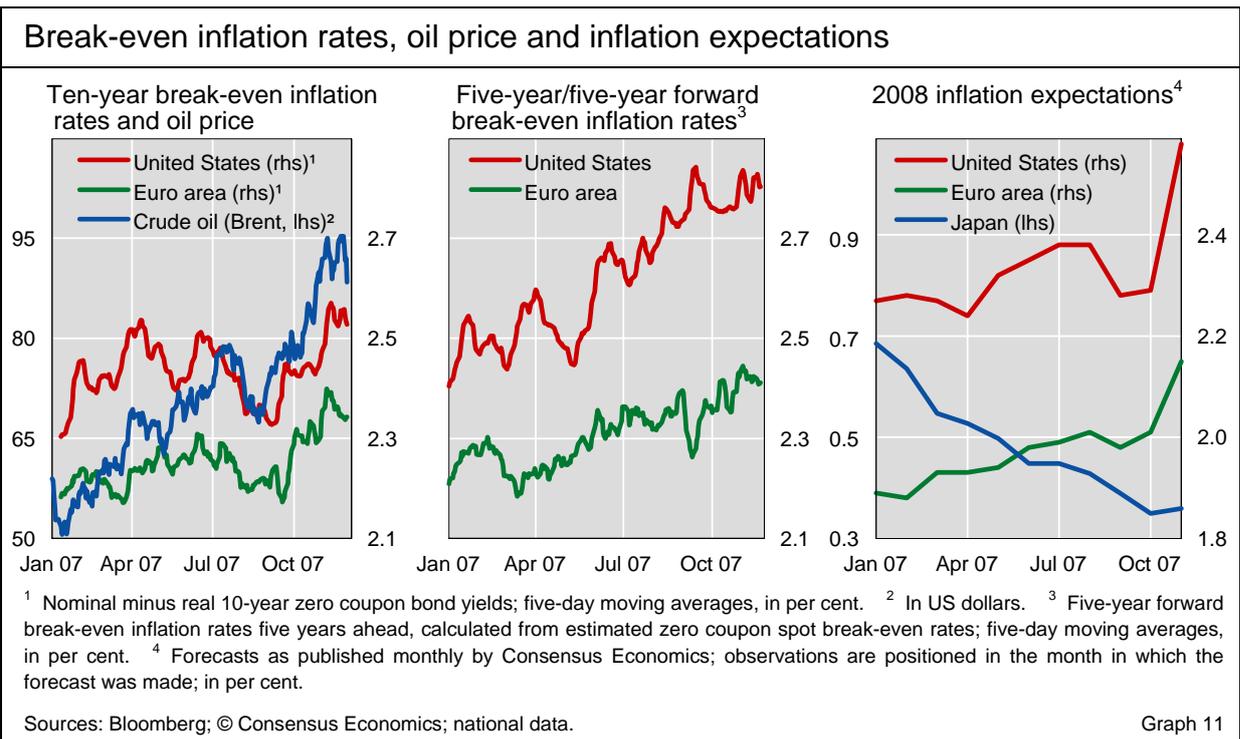
With credit-related jitters returning in October and November, foreign exchange markets experienced currency rate movements similar to those seen in the first round of the credit crisis. Reduced risk appetite and rising volatility once again prompted investors to roll back some of their carry trades. As a result, low-yielding funding currencies, such as the Japanese yen and the Swiss franc, strengthened against higher-yielding “target currencies” including the New Zealand dollar and the Australian dollar. However, in contrast to the experience during the summer months, the US dollar suffered a considerable and protracted fall between September and November, reaching repeated all-time lows against the euro and multi-year lows against the yen and a range of other currencies (Graph 10, right-hand panel). Expectations that US policy rates would be reduced more and faster than those in most other economies seem to have played an important role in explaining this dollar weakness.

One further characteristic of the financial turbulence during the period under review was that it was associated with a rise in break-even inflation rates in both the United States and the euro area. While 10-year break-even inflation rates in these economies had remained stable or had declined somewhat at the time of the mini sell-off in February–March as well as during the first bout of turbulence in the summer, they rose by around 20 basis points in the United States and 10 basis points in the euro area between end-August and end-November (Graph 11, left-hand panel). This seemed to signal an apparent increase in expected inflation, in line with survey data indicating a pickup in US and euro area inflation expectations for 2008 (Graph 11, right-hand panel). An increase in the correlation between oil prices and break-even inflation rates in recent months suggests that a significant part of the increase in inflation expectations might have been due to the surge in oil prices that took place during much of the period. Nonetheless, investors’ perceptions about monetary policy might also have played a role. Five-year forward break-even rates five

... as the slide of the dollar continues

Rising break-even rates signal higher inflation expectations ...

... as oil prices rise ...



years ahead, which are less likely to be influenced by increasing oil prices and other transient shocks, continued to rise to relatively elevated levels in both the United States and the euro area (Graph 11, centre panel). Investors seemed increasingly to take the view that central banks might have to maintain a more accommodative policy stance than normal in order to contain risks to economic growth stemming from the fragility in financial markets.

... and monetary policy is expected to be more accommodative

### Emerging markets show signs of de- and recoupling

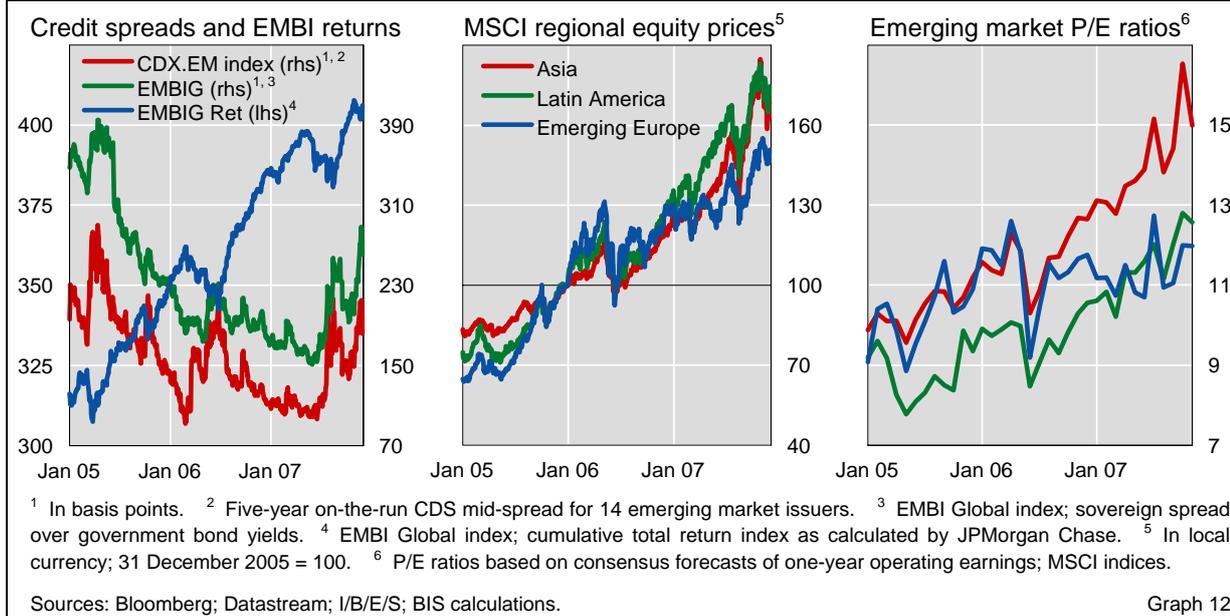
Emerging market assets continued to be generally supported by perceptions that downside risks to growth in many emerging market economies would be more limited than for the United States and other industrialised economies. Reflecting this so-called “decoupling” theme, and following large gains between end-August and late October, major emerging market equity indices outperformed their counterparts in the mature markets. However, with emerging market credit spreads seeing renewed widening from mid-October, a growing gap between credit and equity market developments suggested diverging investor views about the sustainability of relative valuations across markets and countries. These tensions, in turn, may have contributed to weaker equity markets later in the period.

Emerging market assets trade on “decoupling” theme ...

The EMBI Global emerging market bond index gained some 4.3% in return terms between end-August and end-November, and 6.7% from its low point in mid-August. This favourable return performance helped to mask a clear shift in sentiment, which mirrored developments in broader credit markets. Emerging market spreads, which had tightened until 12 October, widened to near 260 basis points at the end of the period, some 4 points higher than the peak on 16 August (Graph 12, left-hand panel). In a sign of continued differentiation

... but bond markets ...

## Emerging market assets



across borrowers, price increases for key commodities, with the WTI oil price pushing through \$90/barrel on 25 October, tended to support issuers such as Ecuador and Venezuela over part of the period.

... as well as equities ...

Emerging market equities rose to successive highs throughout October, before moving off these peaks in November. In part, emerging market valuations profited from positive developments in the US market. Between the FOMC decision on 18 September and 9 October, the day the S&P 500 reached its all-time peak, the MSCI emerging market index gained some 11% in local currency terms and another 5.5% by end-month. While losing part of these gains throughout November, the MSCI index still advanced by about 24% from its low on 17 August. With the US currency depreciating by an effective 3.9% against its emerging market trading partners over the same period, dollar returns were even higher, at near 30% (Graph 12, centre panel).

... are drawn into broader market weakness

While growth forecasts remain favourable ...

Emerging market equities continued to benefit from expectations of robust activity growth, with recent forecasts suggesting global GDP growth of around 4% in 2008. Consensus growth forecasts for China remained more than 1 percentage point higher than a year ago. Reflecting this positive sentiment, earnings forecasts remained robust, which restrained the rise in forward-looking measures of equity valuation. After sustained price gains in many emerging markets up until late October, average price/earnings ratios were, at around 14, roughly on a par with those in major industrialised economies. While weakening equity markets later in the period served to reduce these values, price/earnings multiples in a number of countries remained high by historical standards and relative to other markets. For example, valuations in China and India exceeded those in the United States and Japan by more than 30% and were even higher against their own longer-term averages. To the extent that global macroeconomic conditions helped to sustain these levels, valuations could thus look elevated for some markets if changes to the global outlook were to depress projected earnings (Graph 12, right-hand panel).

... equity valuations in some countries are high by historical standards