VI. Financial markets

Highlights

During the period from June 2007 to mid-May 2008, concerns over losses on US subprime mortgage loans escalated into widespread financial stress, raising fears about the stability of banks and other financial institutions. What initially appeared to be a contained problem quickly spread across other credit segments and broader financial markets to the point where sizeable parts of the financial system became largely dysfunctional. Surging demand for liquidity, coupled with growing concerns about counterparty risk, led to unprecedented pressures in major interbank markets, while bond yields in advanced industrial economies tumbled as investors sought safe havens amid fears that economic growth would weaken. Equity markets in advanced industrial countries were also weak, with financial shares selling off particularly sharply. A bright spot was emerging financial markets, which in contrast to previous episodes of broad-based asset market weakness proved to be more resilient than those in the advanced industrial economies.

The financial market turmoil unfolded in six stages, starting in mid-June 2007: (i) a dramatic widening of spreads on mortgage products following large-scale rating downgrades on subprime mortgage-backed securities and the closure of a number of hedge funds with subprime exposure; (ii) the extension of the sell-off to a wide variety of credit and other markets from mid-July, including structured products more generally; (iii) the expansion of the turmoil into short-term credit and, particularly, interbank money markets from end-July; (iv) broader problems for the financial sector from mid-October, including for companies such as financial guarantors; (v) increasingly dysfunctional markets against the backdrop of a marked worsening of the US macroeconomic outlook from early 2008, accompanied by rising fears about systemic risks, when spreads of even the highest-quality assets moved out to unusually wide levels; (vi) recovery in the wake of the Federal Reserve-facilitated takeover of a troubled US investment bank in March 2008.

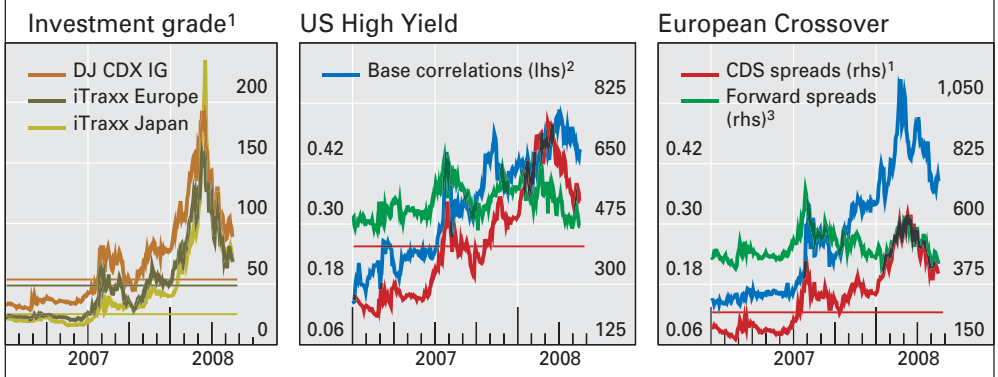
Anatomy of the credit market turmoil of 2007–08

Credit markets sold off markedly ...

Global credit markets experienced a large-scale sell-off during the period under review, as broad-based deleveraging combined with uncertainty about the size and valuation of credit exposures. The chain of events started with what appeared at first to be a relatively contained problem in the US subprime mortgage sector, but quickly spread to other markets. In an environment of rather accommodative financial conditions and elevated risk appetite, use of credit derivatives and securitisation technology had aided the build-up of substantial leverage in the financial system as a whole. When this leverage started to be unwound in the face of subprime losses, price deterioration led to margin calls and further deleveraging. With liquidity evaporating, valuations

... in what started as a "subprime crisis"

Major credit default swap indices



[1] Five-year on-the-run CDS mid-spread, in basis points, on index contracts of investment grade (DJ CDX IG, iTraxx Europe, iTraxx Japan) and sub-investment grade (DJ CDX High Yield, iTraxx Crossover) quality. The horizontal lines indicate the pre-2007 averages (DJ CDX IG: 2003–06; iTraxx Europe: 2002–06; iTraxx Japan: 2004–06; DJ CDX High Yield: 2001–06; iTraxx Crossover: 2003–06). [2] Default correlations implied by the prices of 0–10% loss tranches referencing the respective indices. [3] Implied five-year CDS spread five years forward, calculated with a recovery rate of 40% assuming continuous time and coupon accrual, in basis points.

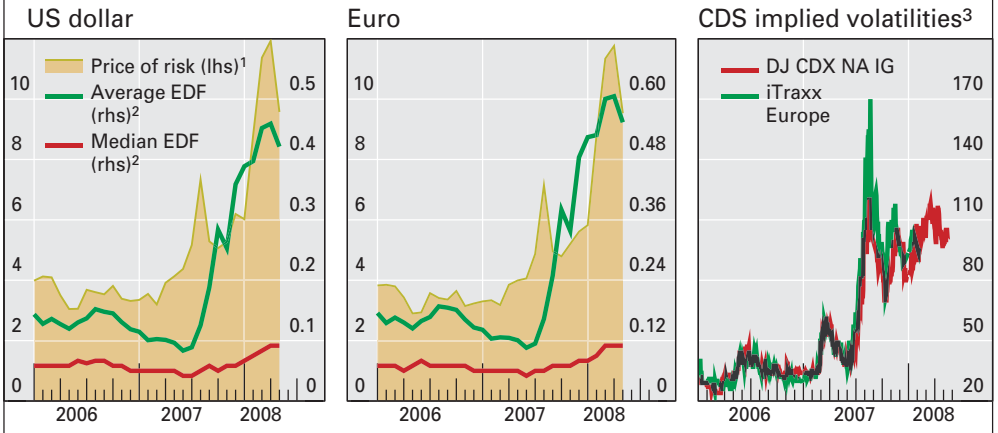
Sources: JPMorgan Chase; Markit; BIS calculations. Graph VI.1

came under greater downward pressure and became increasingly uncertain. The resulting retrenchment of positions across markets triggered a sharp and disorderly repricing of risky assets that continued through much of the period.

Spreads widened sharply …

In the process, credit spreads across markets widened markedly from the unusually tight levels observed in early 2007 (Graph VI.1). Rising spreads coincided with a substantial increase in volatilities implied by credit default swap (CDS) index options (Graph VI.2, right-hand panel). After a spike early during the turmoil, volatilities have remained elevated relative to the levels

Risk appetite in credit markets

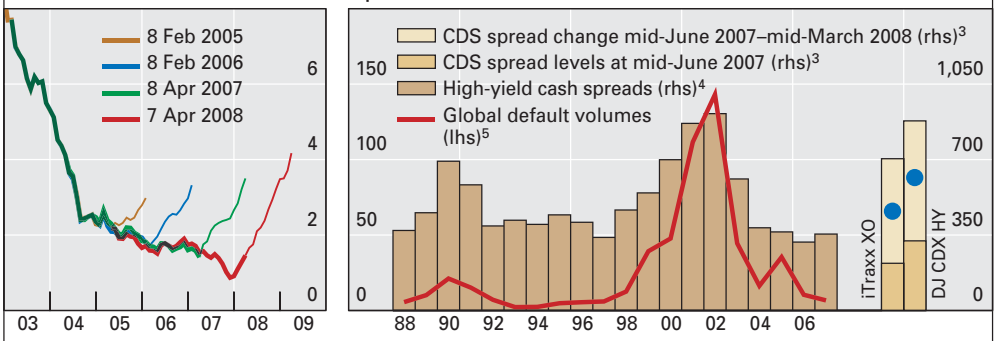


[1] Ratio of risk neutral to empirical probabilities of default. Empirical probabilities are based on Moody's-KMV expected default frequency (EDF) data. Estimates of risk neutral default probabilities are derived from CDS spreads (document clause MR) and estimates of the recovery rate. The reported ratio is the value for the median name in a sample of BBB-rated and non-investment grade entities. [2] In per cent. [3] Five-year at-the-money one- to four-month option-implied volatility of US (CDX IG) and European (iTraxx Europe) investment grade CDS spreads, in per cent.

Sources: JPMorgan Chase; Markit; Moody's KMV; BIS calculations. Graph VI.2

Corporate spread levels, default rates and default volumes

Default rates and forecasts[1] Spread levels[2] and default volumes



[1] Global 12-month speculative grade default rate forecasts by Moody's at the time of the legend date, in per cent; the thick lines refer to historical default rates; the thin lines refer to forecasts one year ahead. [2] In basis points. [3] Spreads over Treasuries (European Crossover: iTraxx XO and US High Yield: DJ CDX HY), adjusted with five-year swap spreads; the dot indicates the CDS spread level prevailing in mid-May 2008. [4] Average monthly global high-yield bond spreads over Treasuries. [5] Moody's annual global speculative grade corporate bond and loan default volumes, in billions of US dollars.

Sources: Deutsche Bank; JPMorgan Chase; Moody's; BIS calculations. Graph VI.3

observed since index inception in 2002–03, indicating heightened uncertainty about shorter-run developments. Plummeting investor risk tolerance, in turn, resulted in sharply rising risk premia for credit products (Graph VI.2, left-hand and centre panels). The price of credit risk, as extracted from credit spread-implied and empirical default probabilities of lower-quality borrowers, increased markedly in June and July, and further into 2008.

... and volatilities spiked ...

Even though markets recovered somewhat late in the period under review, credit spreads had risen by mid-May 2008 to levels comparable to the higher range of those seen in earlier cycles, consistent with market perceptions of a pronounced increase in default risk. In recent years, corporate default rates had invariably come in below rating agencies' forecasts, reaching low levels in both relative and volume terms (Graph VI.3). However, in contrast to previous years, the default correlations implied by tranched index products were elevated, suggesting markets placed greater weight on the risks of a sudden rise in default rates. The relative stability of implied forward spreads for the medium and longer term, in turn, indicated that much of this added risk was anticipated for the near term (Graph VI.1, centre and right-hand panels). At the same time, at their widest levels in March 2008, high-yield CDS spreads had remained some 250 basis points below the highest comparable cash market spreads observed in September 2002. This, in combination with easy financing conditions and known slippages in underwriting standards over recent years, suggested room for renewed spread increases should the macroeconomic and financial environment continue to deteriorate (Graph VI.3, right-hand panel).

... to levels consistent with strongly rising default rates

Stage one: the initial subprime crisis (June–mid-July 2007)

The first of the six stages of credit market turmoil began in mid-June 2007. Signs of an imminent repricing of risk had first emerged in January and February, following a softening of US residential property prices as far back as

Timeline of key events

2007	
14–22 June	Rumours surface that two Bear Stearns-managed hedge funds invested in securities backed by subprime mortgage loans have incurred heavy losses and that $3.8 billion worth of bonds are up for sale to finance margin calls. News reports eventually confirm that one of the funds is kept open through a loan injection, while the other is to be liquidated.
10–12 July	S&P places $7.3 billion worth of 2006 vintage ABS backed by residential mortgage loans on negative ratings watch and announces a review of CDO deals exposed to such collateral; Moody's downgrades $5 billion worth of subprime mortgage bonds and places 184 mortgage-backed CDO tranches on downgrade review. Fitch places 33 classes from 19 structured finance CDOs on credit watch negative.
30 July–1 August	Germany's IKB warns of subprime-related losses and reveals that its main shareholder, Kreditanstalt für Wiederaufbau (KfW), has assumed its financial obligations from liquidity facilities provided to an ABCP conduit exposed to subprime loans. A €3.5 billion rescue fund is put together by KfW and a group of public and private sector banks.
31 July–9 August	American Home Mortgage Investment Corporation announces its inability to fund lending obligations and, one week later, files for Chapter 11 bankruptcy. Union Investment, a German fund manager, stops withdrawals from one of its funds. Three ABCP programmes, including one linked to American Home, extend the maturity of their liabilities, the first ever such extensions. BNP Paribas freezes redemptions for three investment funds, citing an inability to value them in the current environment.
9–10 August	The ECB injects €95 billion of overnight liquidity into the interbank market, marking the beginning of a set of extraordinary moves by the central bank community. The Federal Reserve conducts three extraordinary auctions of overnight funds, injecting a total of $38 billion, and issues a statement similar to that of the ECB.
13–17 September	Northern Rock, a UK mortgage lender, runs into liquidity problems, which eventually trigger a bank run and the announcement of a deposit guarantee by the UK Treasury.
18 September–4 November	Repeated writedowns and quarterly losses are reported by major financial institutions. A number of high-profile CEOs leave their positions amid top management reorganisations.
11–23 October	Moody's downgrades some 2,500 subprime bonds issued in 2006, followed by a series of S&P subprime downgrades in the following days. S&P also puts 590 CDOs on ratings watch negative and downgrades 145 tranches of CDOs worth $3.7 billion; Moody's downgrades 117 CDO tranches later in the same week, and Fitch places some $37 billion worth of CDOs under review.
24 October–5 November	Various financial guarantors announce third quarter losses; Fitch announces that it is considering cutting the AAA rating of certain monoline insurers.
12 December	Central banks from five currency areas announce coordinated measures designed to make turn-of-the year funding available to a larger number of institutions.
19 December	ACA, a financial guarantor rated A, is downgraded by S&P to CCC, triggering collateral calls from its counterparties for which repeated waiver periods are negotiated during the following months. S&P's rating outlooks for other monolines are lowered from stable to negative.

Continued on page 96.

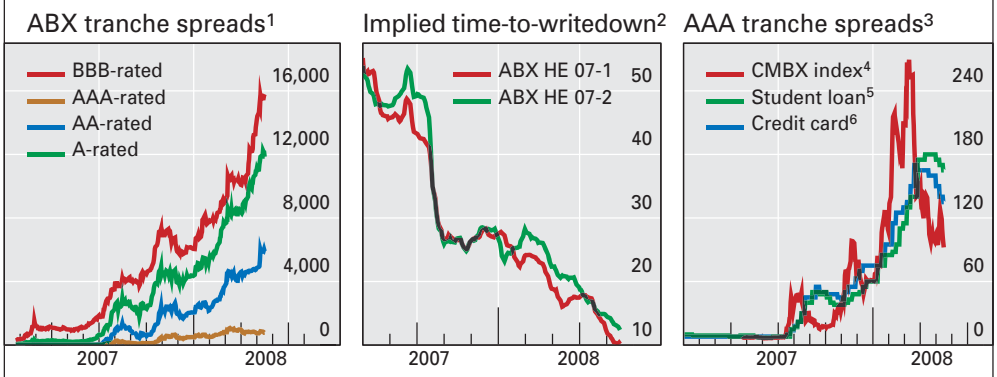
2008	
2–4 January	Weak purchasing managers' data and labour market reports point to a marked weakening in the US economy and trigger fears about global growth.
14–31 January	The ECB, Federal Reserve and Swiss National Bank carry out additional long-term funding operations in US dollars.
15 January	Citigroup announces a fourth quarter loss, partly due to $18 billion of additional writedowns on mortgage-related exposures, starting another string of similar news from other financial institutions.
18–31 January	Fitch downgrades Ambac, a monoline insurer, by two notches from AAA and later also downgrades monolines SCA and FGIC to A and AA respectively. Some 290,000 insured issues, mostly municipal bonds, are downgraded as a result. Later, S&P downgrades FGIC to AA, and further rating actions by all three major rating agencies are taken on the monolines in the following weeks.
21–30 January	The Federal Reserve delivers a 75 basis point inter-meeting rate cut, following broad-based global equity and credit market weakness. The policy rate is lowered by another 50 basis points in the following week.
28 February–7 March	Peloton Partners announces the closure of a $2 billion ABS fund and temporarily halts redemptions from another fund, following margin calls by lenders. Thornburg Mortgage admits delays in meeting margin calls on repo borrowings and eventually defaults on such payments. Carlyle Group's mortgage bond fund also fails to meet margin calls, leading to a suspension of trading as investors force the sale of some of the fund's holdings. Pressures spread to European government bond markets, with pronounced liquidity tiering across issuers and market segments.
7–16 March	The Federal Reserve announces an increase of $40 billion in the size of its new Term Auction Facility and, a few days later, expands its securities lending activities through a $200 billion Term Securities Lending Facility that lends Treasury securities against a range of eligible assets. Later the same week, it announces a new Primary Dealer Credit Facility that extends discount window-type borrowing to the primary dealer community. Additional initiatives are announced by other central banks, including renewed auctions of US dollar funds.
14–17 March	Failure to roll over repo funds causes an acute liquidity shortage at Bear Stearns, emergency discount window borrowing and a subsequent takeover by JPMorgan.
2 May	The ECB, Federal Reserve and Swiss National Bank announce a further expansion of their US dollar liquidity measures.

Sources: Bloomberg; *Financial Times*; *The Wall Street Journal*; company press releases. Table VI.1

The initial sell-off was confined to subprime credits …

2006. However, this early sell-off of instruments exposed to mortgage credit was partly reversed during subsequent months. By contrast, in June, with evidence of a severe erosion in mortgage quality accumulating since 2006, large-scale rating actions on subprime residential mortgage-backed securities (RMBS) coincided with news about the imminent shutdown of two hedge funds with large subprime exposures (Table VI.1). As the two funds were forced to delever, concerns about distressed asset sales caused credit spreads for subprime mortgage products to widen beyond their previous peaks (Graph VI.4, left-hand panel).

US securitisation markets



[1] Implied index spreads from CDS contracts on subprime mortgage bonds (index series ABX HE 07-1), in basis points. [2] Implied time to full writedown (loss) of tranche principal in months; calculated from prices for the ABX HE 07-1 and 07-2 index series (backed by subprime MBS originated in the second half of 2006 and the first half of 2007, respectively) referencing tranches rated BBB–. [3] In basis points. [4] Spreads on CDS index contracts referencing AAA-rated tranches of US commercial mortgage-backed securities (CMBX index, series 3). [5] Ten-year student loan ABS spreads to one-month Libor. [6] Ten-year floating credit card loan spreads to one-month Libor.

Sources: JPMorgan Chase; Markit; BIS calculations. Graph VI.4

Stage two: spillovers into other credit markets (mid- to end-July 2007)

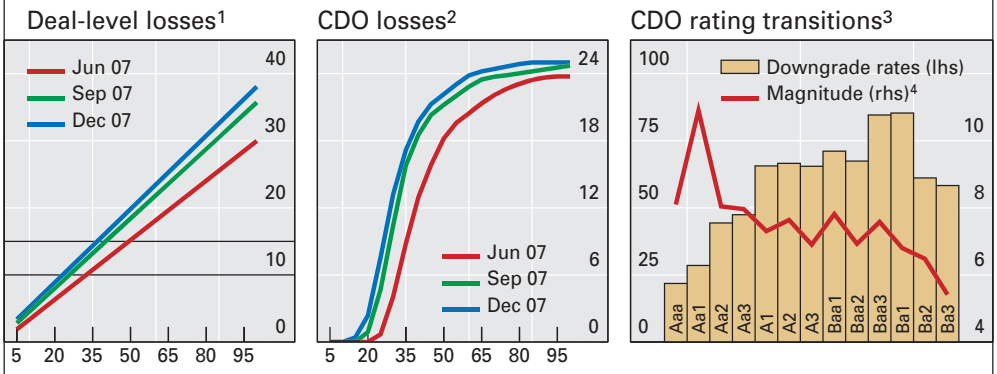
... but quickly spread across markets ...

While valuation losses on higher-rated exposures and instruments other than residential mortgage products were initially quite limited, the sell-off spread quickly during the second stage of the turmoil (Graph VI.4, left- and right-hand panels). Increasingly, lenders felt inadequately protected in an environment of rising volatility, leading to larger haircuts on RMBS, margin calls and more broad-based deleveraging. Amid concerns about forced sales of better-quality assets, mark to market losses mounted. As a result, the turmoil deepened from mid-July and into August, affecting such sectors as leveraged loans and commercial mortgages. As demand for loans and similar assets from collateralised debt obligations (CDOs) dried up, numerous leveraged buyout (LBO) deals had to be delayed or pulled from the market. Commercial mortgage-backed securities faced similar strains, as evidenced by indicators such as the CMBX index, possibly reflecting concerns about the extent to which weakening underwriting standards in the residential sector might have spread to the commercial mortgage business (Graph VI.4, right-hand panel).

... reflecting uncertainties about the size and distribution of losses ...

Uncertainties about the size and distribution of mortgage-related losses, as well as the lags until their realisation, were among the key drivers of market developments. With these uncertainties also came increased doubts about the reliability of ratings for structured finance products and the impact of the deterioration in mortgage quality on rating transitions. As mortgage delinquencies accumulated, so did projected losses, implying loss rates on recent-vintage subprime mortgage pools of 20% or higher, even under fairly optimistic assumptions (Graph VI.5, left-hand panel). On this basis, investors grew increasingly concerned about losses spreading along the securitisation chain, for example on instruments such as CDOs that themselves resecuritise mezzanine tranches of subprime mortgage deals. Projected losses on such

Subprime markets: loss projections and rating transitions



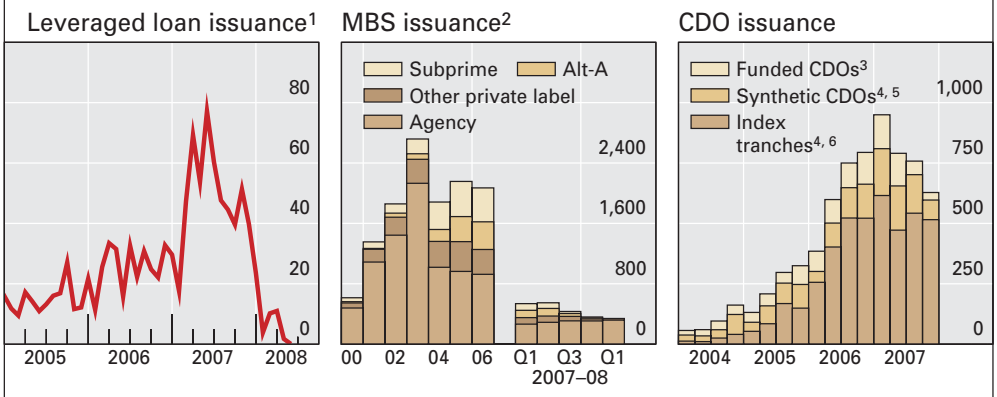
[1] Average projected lifetime loss (vertical axis; as a percentage of original balance) on the constituent subprime mortgage securitisations underlying the ABX HE 07-1 index for different losses-given-default (horizontal axis; as a percentage of original balance) and a delinquency-to-default transition assumption of 65%; calculated from delinquency data using the methodology described in the Overview chapter of the December 2007 *BIS Quarterly Review*. Horizontal lines mark the 10% and 15% loss levels. [2] Average projected loss (vertical axis; as a percentage of original balance) on hypothetical CDOs backed by mezzanine (10–15%) tranches of the ABX HE 07-1 index for different losses-given-default (horizontal axis) and an assumed ABX HE allocation of 25% of the CDO pool; the remainder of the pool is assumed unimpaired. [3] End-2007 downgrade rates (number of downgraded tranches as a percentage of rated tranches) for Moody's-rated 2006 and 2007 vintage US structured finance CDO tranches, by original rating. [4] Average downgrade magnitude in notches.

Sources: JPMorgan Chase; Moody's; UBS; BIS calculations. Graph VI.5

CDOs are quite sensitive to adverse changes in credit quality within the underlying mortgage pools as well as in assumed loss severities, both of which made it progressively likelier that the tranches included in the CDO pool might be wiped out completely. Mortgage market deterioration and revised rating agency assumptions thus translated into unprecedented rating transitions, in terms of both scale and magnitude, for instruments backed by subprime collateral (Graph VI.5, centre and right-hand panels).

Issuance volumes

In billions of US dollars



[1] Leveraged buyouts; global volumes. [2] US residential mortgage-backed securities. [3] Cash flow CDOs. [4] Notional amount, not adjusted for the riskiness of different tranches. [5] Portfolio CDS referenced to corporations, sovereigns and ABS. [6] Portfolio CDS referenced to CDS indices.

Sources: Dealogic; LoanPerformance; SIFMA; UBS. Graph VI.6

... and unprecedented numbers of rating downgrades

Against this background, large parts of the investor community essentially withdrew from structured assets altogether. Investors, particularly those that had historically relied chiefly on ratings in their risk management and investment decisions, started to question that reliance in the face of the unexpected and growing wave of downgrades. Loss of confidence in structured finance ratings, in turn, meant that demand for tranched credit products collapsed from the high levels observed in recent years, aggravating the decline in issuance volumes that had started early in the credit crisis (Graph VI.6). Activity in single- and multi-name CDS, in contrast, held up throughout the turmoil, with notional amounts growing by more than 35% during the second half of 2007.

Stage three: squeezed liquidity and involuntary reintermediation (August 2007)

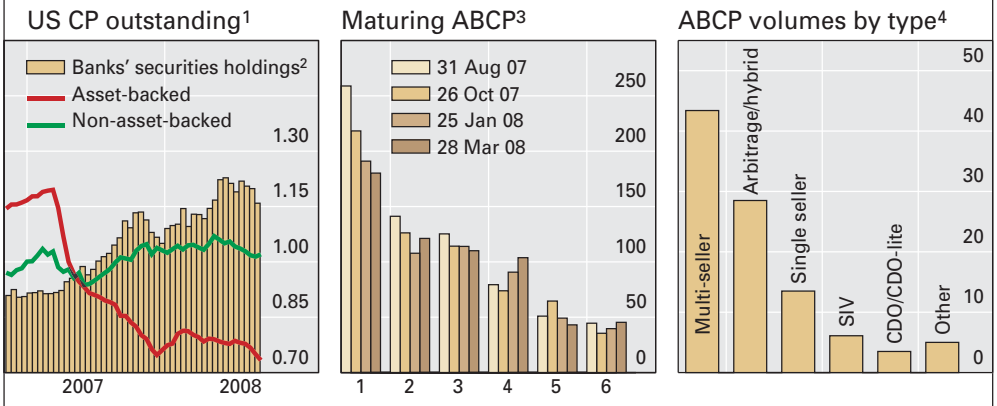
A full-blown crisis erupted in August ...

The third stage saw the credit market turmoil expand into short-term credit and interbank money markets. The initial mortgage market correction had been accommodated by the dealer community, which absorbed the affected assets in the face of shrinking demand. As originators continued to feed new loans into the securitisation pipeline, dealers withdrew, forcing the originators to draw down bank lines for financing. Investors, in turn, began to focus more closely on credit quality and valuation challenges in illiquid markets, and a number of asset managers halted redemptions on investment funds.

... following investor withdrawal from ABCP ...

As the crisis turned increasingly into one of asset valuation, investors pulled out of the market and caused an unprecedented wave of involuntary reintermediation. The first signs of the impending liquidity squeeze came in the asset-backed commercial paper (ABCP) market, when issuers began to encounter difficulties rolling over outstanding volumes. Pressures were particularly intense for structures with less than complete liquidity support from their sponsoring financial institutions, such as ABCP financing the asset pools of structured investment vehicles (SIVs), or paper backed by assets linked to

Asset-backed commercial paper (ABCP) markets



[1] In trillions of US dollars. [2] Holdings of "other securities" by large domestically chartered commercial and foreign-related banks in the United States; not seasonally adjusted. [3] Maturity of outstanding ABCP, weeks after date; in billions of US dollars. [4] Global outstanding volumes at end-March 2007 by issuing vehicle; as a percentage of total volumes.

Sources: Federal Reserve Board; Bloomberg; Citigroup; BIS calculations. Graph VI.7

individual originators (Graph VI.7, right-hand panel). Volumes collapsed and the maturity profile of outstanding paper deteriorated, with markets stabilising only in early 2008. While some of the most troubled conduits were liquidated, many migrated back onto the balance sheets of their sponsors, adding to banks' securities holdings (Graph VI.7, left-hand and centre panels). As a result, when nervousness about funding needs and banks' conditional liabilities intensified, liquidity demand surged, causing an outsize and protracted disruption in interbank money markets that signalled the advent of a broader financial market crisis.

... and surging demand for liquidity in interbank markets

Stage four: broad-based financial sector strains (September–November 2007)

Credit markets recovered temporarily in September, but experienced a new bout of large-scale spread widening in October and November. The respite was afforded in part by repeated central bank liquidity injections aimed at easing the squeeze in money markets. Late September, in particular, saw a broad upturn in credit markets, with the US Federal Open Market Committee's decision to cut the federal funds target by 50 basis points on 18 September triggering a strong price reaction across all market segments. Adding to the positive sentiment, sizeable write-offs announced by major commercial and investment banks were seen as providing much needed transparency about mortgage-related losses. Recovering demand for such exposures, in turn, allowed banks to place some of their accumulated leveraged loan and bond deals that were awaiting financing (Graph VI.6, left-hand panel; see Chapter VII for more detail). However, sentiment worsened again from mid-October, following another wave of downgrades of RMBS and CDO ratings and negative financial sector news.

After a short respite ...

... sentiment worsened once again ...

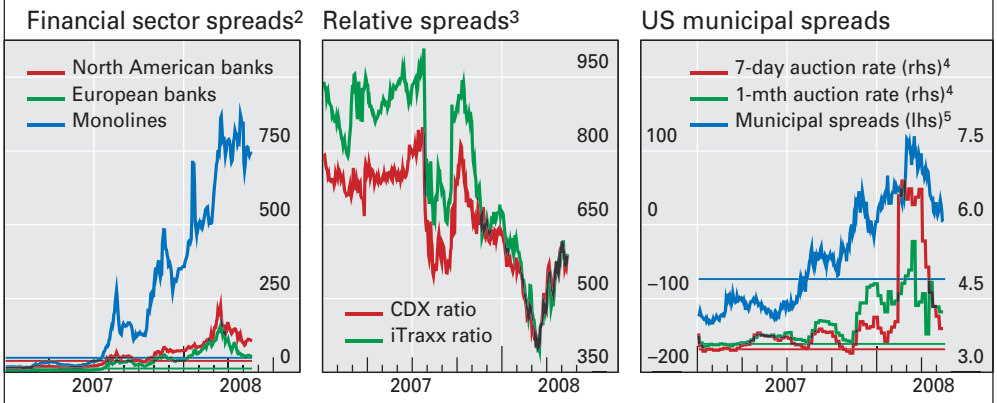
During this fourth stage of the turmoil, credit-related losses in the financial sector turned out to be larger than expected, adding to uncertainties about asset valuations and fears of broader economic weakness (see Chapter VII). Large upward revisions of earlier writedown announcements, in particular, triggered investor doubts about banks' ability to appropriately value and manage their exposures. Combined with renewed credit market weakness, this suggested that even more losses could be about to materialise. One sign of concern about related financial sector strains was the pricing of credit protection against the default risk of banks and other financial institutions, with spreads rising above the peaks they had reached during the summer (Graph VI.8, left-hand panel).

... following repeated writedowns by major banks ...

Continued uncertainty about valuations was prompted in part by fears about asset sales by structured vehicles and further mortgage market deterioration. One factor was ratings-based and market value-related structural provisions in CDOs and SIVs that seemed likely to force liquidations of underlying collateral pools once deal-specific threshold levels were crossed. Another factor was that losses on subprime exposures were increasingly expected to eventually push through existing subordination layers (Graph VI.5, left-hand panel), leading the more senior tranches of recent mortgage securitisations to underperform lower-rated ones. Prices on the latter tranches, in turn, started to reflect expectations of full writedown of tranche principal

... concerns about ongoing deleveraging ...

Financial sector and municipal spreads[1]



[1] The horizontal lines indicate pre-2007 averages (left-hand panel: 2001–06; right-hand panel: seven-day and one-month rate: May–December 2006, municipal spreads: 2001–06). [2] The sample consists of 14 investment and commercial banks headquartered in North America, 11 universal banks headquartered in Europe and seven financial guarantors for the monolines; in basis points. [3] Relative spread movements on the basis of five-year on-the-run CDS index spread ratios; for the CDX, high-yield over investment grade index; for the iTraxx, crossover over main index. [4] SIFMA tax-exempt index rate, in per cent. [5] Over two-year Treasury bonds, in basis points.

Sources: Bloomberg; Markit; BIS calculations. Graph VI.8

by early 2010. While a further deterioration in mortgage fundamentals subsequently accelerated these implied times-to-writedown, loss accumulation was still expected to continue well into 2009 (Graph VI.4, centre panel).

... and looming monoline downgrades

In the process of these price adjustments, mortgage-related losses also started to emerge outside the banking sector, particularly among monoline financial guarantors, entities that specialise in writing insurance on a variety of highly rated bonds and structured products. Widening credit spreads on senior tranches of structured instruments had translated into mark to market losses on the value of insurance the monolines had written on mortgage-backed products. Anticipated increases in future claims thus caused CDS spreads of the monolines to widen sharply in the fourth quarter and into the new year, foreshadowing a string of negative rating actions on key monolines (Graph VI.8, left-hand panel). Looming monoline downgrades, in turn, meant further pressures on bank balance sheets arising from expected valuation changes for credit insurance that had been provided on banks' retained exposures to senior CDO tranches, as well as from liquidity backstops for monoline-enhanced money market instruments. As a result, the widening of financial sector spreads was more pronounced than that of other market segments, contributing to an overall underperformance of investment grade benchmarks vis-à-vis lower-quality assets (Graph VI.8, centre panel).

Stage five: growth fears and dysfunctional markets (January–mid-March 2008)

Amid rising fears about growth ...

After a short lull in credit market conditions in December, disappointing macroeconomic indicators caused yet another widespread repricing of risk in early 2008. This fifth period of very negative credit market sentiment followed the release of data in early January indicating weak growth in the US manufacturing sector along with disappointing labour market developments.

Concerns about risks to growth were further fuelled by rising fears of a credit crunch (see Chapters II and VII). Related nervousness about feedback effects between macroeconomic and financial developments reached a climax on 21 and 22 January. Following the downgrade of a large monoline insurer the previous Friday, risky assets sold off across markets and countries, and markets remained volatile into February and March, despite extraordinary policy rate cuts by the Federal Reserve on 22 and 30 January.

... credit markets turned increasingly dysfunctional ...

By that point, investor withdrawal from various financial markets had intensified to such an extent that parts of the financial system became dysfunctional, causing further financial retrenchment. Reflecting these difficult conditions, spreads on even the most highly rated and otherwise liquid assets reached unusually wide levels in early 2008. This included markets, such as those for certain US student loan securitisations, whose underlying exposures are almost entirely protected by federal guarantees (Graph VI.4, right-hand panel). While, at these elevated spread levels, primary issuance continued, arranging banks were finding it difficult to place anything but the most senior tranches. With the remainder of the issued structures being retained, this added to existing constraints on bank capital.

... triggering further deleveraging ...

In late February and early March, with balance sheet pressures continuing to intensify, banks sought to further cut their exposures across various business lines, contributing to another fall in investor risk appetite. One such move was the withdrawal of banks' implicit liquidity support for an estimated $330 billion worth of auction rate securities, which provide long-term financing to municipal and other borrowers in the United States at variable short-term interest rates tied to an auction process. Failed auctions and the resulting rate resets thus raised the cost of financing for these borrowers (Graph VI.8, right-hand panel). Pressures were also evident elsewhere, such as in the markets for highly rated US agency and private label mortgage-backed securities, which experienced a rapid increase in price uncertainty. The deterioration in confidence regarding asset values culminated in early March, when the tightening of repo haircuts caused a number of hedge funds and other leveraged investors to unwind existing exposures, threatening a cascade of further margin calls and widening spreads.

... and heightened asset price uncertainty

Repeated central bank action ...

Events came to a head in the week beginning 10 March. This started with the Federal Reserve's announcement of an expansion of its securities lending activities targeting the large US dealer banks, later supplemented by a temporary facility providing overnight loans against a broad range of collateral (see Chapter IV). While the initial announcement seemed to provide temporary relief, the US investment bank Bear Stearns suffered a severe liquidity shortage later in the week. This led to its takeover by JPMorgan the following Monday, a measure facilitated by the Federal Reserve.

... and the takeover of a major investment bank ...

Stage six: the crest of the credit crisis to date (mid-March–May 2008)

... seemed to mark a turning point in market sentiment

These developments appeared to herald a turning point, with markets moving into the sixth and, to date, final stage of the financial turmoil. Consistent with perceptions of a considerable reduction in systemic risk, spreads, particularly those for financial sector and other investment grade firms, retreated

substantially following the takeover of Bear Stearns from the peaks reached during previous weeks. Amid signs of short covering, the tightening continued through April, with spreads rallying back to where they had been in mid-January, and seeming to stabilise around these levels from early May.

Even so, interbank money markets failed to recover. Given continued capital and funding constraints for some investors as well as the disappearance of demand from structures such as SIVs and CDOs, large overhangs of credit exposure continued to weigh on markets. By mid-May, with the credit cycle continuing to deteriorate and higher default rates looming, it remained unclear whether liquidity supply and risk appetite had recovered sufficiently to help maintain this improved credit market environment on a sustained basis.

Money markets hit by liquidity squeeze

Severe disruptions in interbank markets ...

One of the key distinguishing features of the financial turmoil was the onset of unprecedented dislocations in interbank markets, and in money markets more broadly, resulting from a surge in liquidity demand and a loss of confidence in the creditworthiness of counterparties. The initial trigger for these severe tensions was serious liquidity disruptions in the $1.2 trillion ABCP market during the third stage of the unfolding financial turmoil, as described above. These disruptions quickly led to deep concern about the adverse effects of potentially large-scale reintermediation linked to banks providing backup credit lines for vehicles active in the ABCP market and, subsequently, in other markets. Worries about the liquidity and capital implications for banks engendered growing distrust towards counterparties, while uncertainty about the stability of the banking system as a whole grew, as indicated by widening swap spreads (see below). In this environment, banks became less willing to lend money to other banks, while, at the same time, concerns about their own liquidity requirements led to rapidly increasing demand for borrowed funds. Adding to this, money market mutual funds, which traditionally have been providers of funding for banks, shifted a large portion of their investments away from banks and into safe government debt, as their appetite for risk fell sharply (see below).

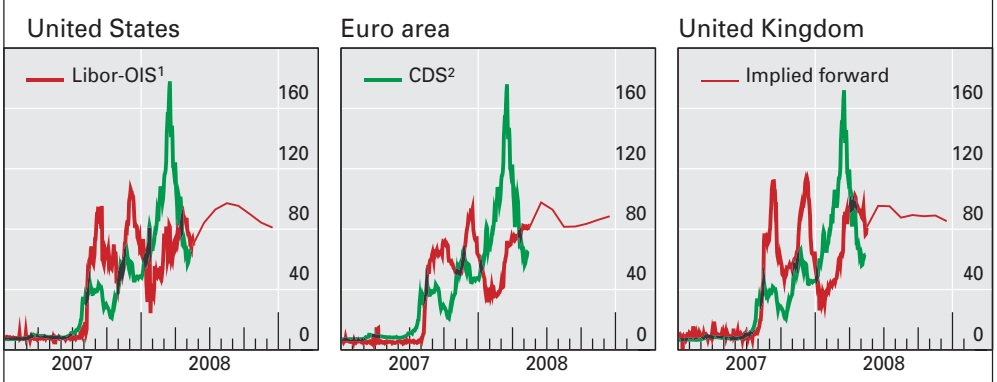
Central bank liquidity injections alleviated some of the pressures in interbank markets (see Chapter IV), but uncertainty about future liquidity needs and counterparty risk persisted. As a result, interest rates in the interbank market remained elevated and volatile relative to comparable rates throughout much of the period under review. Moreover, with most central banks initially focusing on alleviating strains in the very shortest maturity segment, tensions further out in the maturity spectrum soon became particularly pronounced, inducing central banks to shift their attention increasingly to liquidity shortages at longer maturities.

... led to sharply higher interbank rates ...

Such liquidity strains were evident from the unprecedented, persistent widening of spreads between interbank rates for term lending and overnight index swap (OIS) rates at corresponding maturities. For example, prior to the outbreak of the financial turmoil, three-month Libor rates had exceeded OIS rates by only a few basis points on average, but from late July 2007 the difference surged to levels sometimes exceeding 100 basis points (Graph VI.9).

Interest rate and bank credit spreads

In basis points



[1] Three-month Libor rates minus corresponding OIS rates (for the euro area, EONIA swap). [2] Average of the five-year on-the-run CDS spreads for the panel banks reporting Libor quotes in the domestic currency's panel.

Sources: Bloomberg; BIS calculations. Graph VI.9

Interbank and OIS rates both reflect investors' expectations about future interest rates, but because interbank lending involves payment of the entire principal up front whereas OIS contracts are settled on a net basis at maturity, they differ substantially with respect to their liquidity and credit risk implications. The sharp widening in Libor-OIS spreads therefore clearly signalled some combination of greater preference for liquidity and rising counterparty risk premia. Moreover, implied forward spreads at the end of the period under review suggested that investors expected this to be a persistent phenomenon (Graph VI.9).

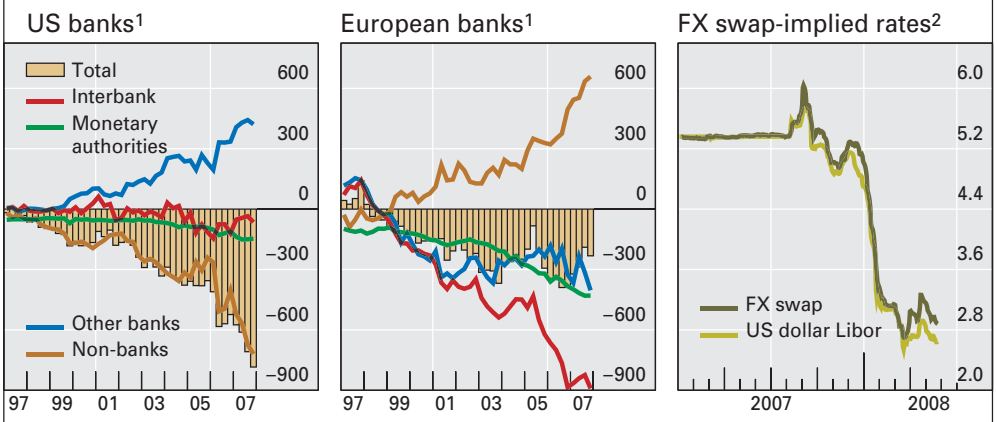
... due to counterparty risk concerns and surging liquidity demand

The relative contributions of liquidity and credit risk to the rise in interbank rates have proved very hard to disentangle, not least because the two components are highly interrelated. The behaviour of Libor banks' CDS spreads vis-à-vis Libor-OIS spreads suggests that, while credit concerns have indeed played a role in driving interbank rates during the turmoil, liquidity factors have accounted for much of the dynamics (Graph VI.9). In addition, the cyclical pattern in Libor-OIS spreads to some extent also indicated seasonal liquidity shortages related to end-quarter and end-year funding concerns, which were more severe than normal after the first half of 2007. Further complicating matters, worries about the reliability of the Libor fixing mechanism began to surface as the gridlock in interbank markets persisted, in particular for US dollar loans. Specifically, market participants voiced suspicions that some banks in the Libor panel may have been reporting rates lower than their actual borrowing costs in order to appear stronger from a liquidity/credit risk perspective. Following reports in April that the British Bankers' Association was investigating this issue, US dollar Libor rates suddenly jumped to levels that seemed more in line with actual borrowing rates.

European banks were hit by dollar funding problems

One characteristic of the strains in interbank markets during the financial turbulence seems to have been difficulties for European banks, in particular, in obtaining US dollar funding, as the demand for dollar liquidity surged. BIS data on banks' total cross-border positions by nationality suggest that

Funding in the US dollar interbank market and swap-implied rates



[1] Net claims by bank nationality; calculated as cross-border claims minus cross-border liabilities. The interbank component is further broken down into inter-office claims (not shown), claims on other banks and claims on official monetary authorities; in billions of US dollars. [2] Three-month FX swap-implied US dollar rates calculated from euro Libor, in per cent; estimated according to the methodology described in N Baba, F Packer and T Nagano, "The spillover of money market turbulence to FX swap and cross-currency swap markets", *BIS Quarterly Review*, March 2008.

Sources: Bloomberg; BIS locational banking statistics by nationality; BIS calculations. Graph VI.10

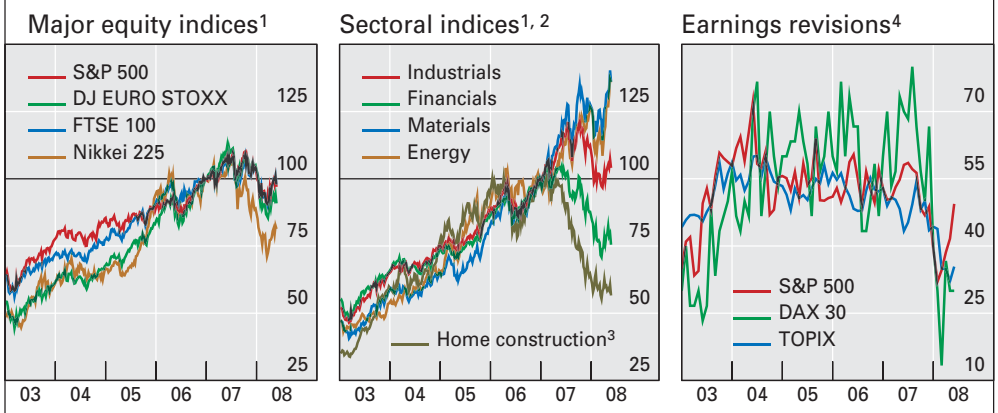
significant differences in the global funding patterns of European and US banks may have been behind these difficulties. Over the past few years, US banks have increasingly borrowed US dollars from non-banks, and have channelled these funds to unaffiliated banks through the interbank market (Graph VI.10, left-hand panel). At the same time, European banks have increasingly transformed interbank funds, and those from official monetary authorities, into US dollar-denominated claims on non-banks (Graph VI.10, centre panel). Overall, by the fourth quarter of 2007, US banks' total net dollar claims on other banks had reached $421 billion, while European banks' net dollar liabilities to banks stood at almost $900 billion. Frequent rollovers by European banks of short-term dollar borrowing in the interbank market, in order to finance longer-term investments in non-banks, had been practised without problems for many years. However, as market tensions rose in the second half of 2007, with European banks sharing in the $380 billion decline in outstanding ABCP volumes that had to be taken back on balance sheet, this need for constant refinancing contributed to the liquidity squeeze witnessed in the interbank market. Some foreign exchange swap and cross-currency swap markets displayed notable signs of strain consistent with this: US interest rates derived from foreign exchange swap prices at times deviated significantly from actual US dollar Libor during the turmoil (Graph VI.10, right-hand panel).

Credit turmoil spilled over to equity markets

Equity prices began to fall over the summer …

Equity prices in the advanced industrial economies began to fall over the summer of 2007, following the widening of CDS spreads during the onset of the credit market turmoil (Graph VI.11, left-hand panel). Stock prices dropped further in late 2007 and early 2008, as renewed credit-related concerns and the

Equity prices and earnings expectations



[1] End-week data, in local currency; end-December 2006 = 100. [2] MSCI equity indices. [3] Equity index calculated by Datastream. [4] Diffusion index of monthly revisions in 12-month forward earnings per share, calculated as the percentage of companies for which analysts revised their earnings forecast upwards plus half of the percentage of companies for which analysts left their forecast unchanged, to adjust for analysts' systematic overestimation of earnings.

Sources: Bloomberg; Datastream; I/B/E/S; BIS calculations. Graph VI.11

worsening of the US macroeconomic outlook triggered worries about future profits and depressed investors' risk tolerance. From mid-March 2008, however, share prices recovered sharply across the board, following the takeover of Bear Stearns by JPMorgan. Between end-March 2007 and mid-May 2008, the S&P index was almost unchanged, while the Nikkei 225 and DJ EURO STOXX indices fell by 18% and 9%, respectively.

Weakness concentrated in the financial sector and Japanese shares

... with bank stocks hit particularly hard

Equity market weakness was initially concentrated in the financial sector, with bank stocks being hit particularly hard. From end-March 2007 to mid-May 2008, global financial shares fell by almost 20%, the fastest pace of decline since the end of 1994, when the Morgan Stanley Capital International (MSCI) financial index became available. By contrast, performance of non-financials was mixed. While the slump in the US housing was reflected in the underperformance and steep decline in share prices in such sectors as housing construction, gains were recorded in the materials and energy sectors, due to the strong performance of commodity markets over the period (Graph VI.11, centre panel).

Japanese equities showed the largest decline

Japanese equities overall showed the largest decline among advanced economy markets (Graph VI.11, left-hand panel). Despite the fact that Japanese financial institutions were reported to be less exposed to subprime loans than their US and European counterparts, Japanese financial shares recorded a large loss. The outsize decline was also due in part to concerns about the negative impact of the US economic slowdown on Japanese exporters, as well as the further appreciation of the yen. Periods of rapid yen appreciation against the dollar have often coincided with weak Japanese share prices in the past. In line with this, the main Japanese share index fell by more than 20% as the yen appreciated by a relatively large 14% against the dollar between end-2007 and mid-March 2008.

Elevated US recession risk weighed on earnings expectations

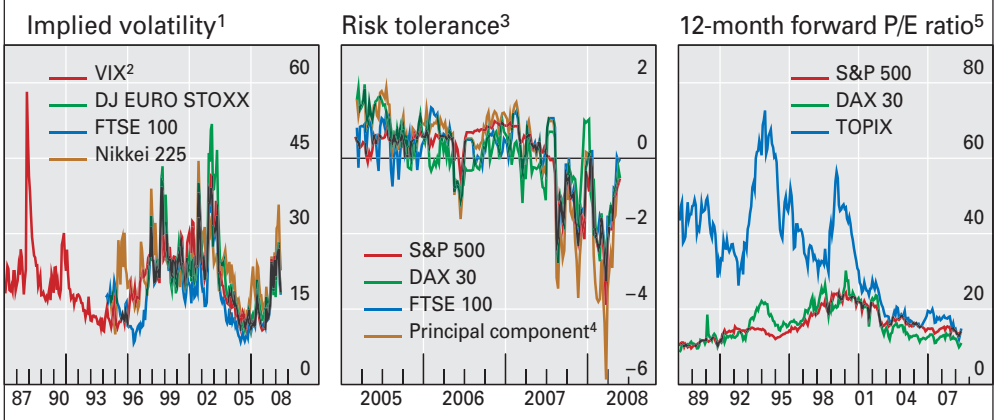
Earnings expectations fell sharply on evidence of weaker economic activity

A key drag on share prices was the sharp reversal in expectations for earnings of listed firms in advanced economy markets. This largely reflected growing concerns that the US slowdown might be more severe and prolonged than previously thought. From mid-2007, diffusion indices of revisions in 12-month forward earnings per share in major markets plunged to levels not seen since 2002 (Graph VI.11, right-hand panel). These downbeat forecasts were subsequently validated by reported earnings. Cumulative earnings per share in the United States fell by more than 20% (year over year, share-weighted basis) in the fourth quarter of 2007, considerably more than the 3% decline in the previous quarter. In January 2008, accumulating evidence of weaker real economic activity prompted further downward revisions to expected earnings. From March 2008, however, earnings expectations started to recover in the United States and key European countries.

Volatility increased and risk tolerance declined

At the same time, heightened uncertainties about the outlook resulted in much higher volatility and declining risk tolerance. Option-implied market volatility in the United States, on an uptrend since early 2007, reached 30% in August 2007 and early 2008, close to levels last seen in April 2003. This is more than twice the 2004–06 average of 14%, and substantially higher than the historical (1986–2006) average of around 20% (Graph VI.12, left-hand panel). Volatilities in other equity markets followed a similar pattern, with the surge being particularly pronounced in Japan, where volatility approached the peak seen in 2001. Indicators of investors' tolerance for risk in equity markets, measured by differences between the statistical distribution of actual equity returns and the distribution implied by option prices, also deteriorated markedly up to March 2008, reaching the lowest levels since 2005 (Graph VI.12, centre panel). Following the news of the takeover of Bear Stearns in mid-March,

Equity market volatility and valuations



[1] Annualised volatility implied by the price of at-the-money call option contracts on stock market indices; monthly averages, in per cent. [2] Based on S&P 500; prior to 1990, based on S&P 100. [3] Derived from the differences between two distributions of returns, one implied by option prices, the other based on actual returns estimated from historical data; weekly averages of daily data. [4] First principal component of risk tolerance indicators for the S&P 500, DAX 30 and FTSE 100. [5] Ratio of the stock price and 12-month forward earnings per share.

Sources: Bloomberg; I/B/E/S; BIS calculations. Graph VI.12

however, equity prices in advanced industrial economies rebounded, in line with a decline in volatilities and recovering risk appetite.

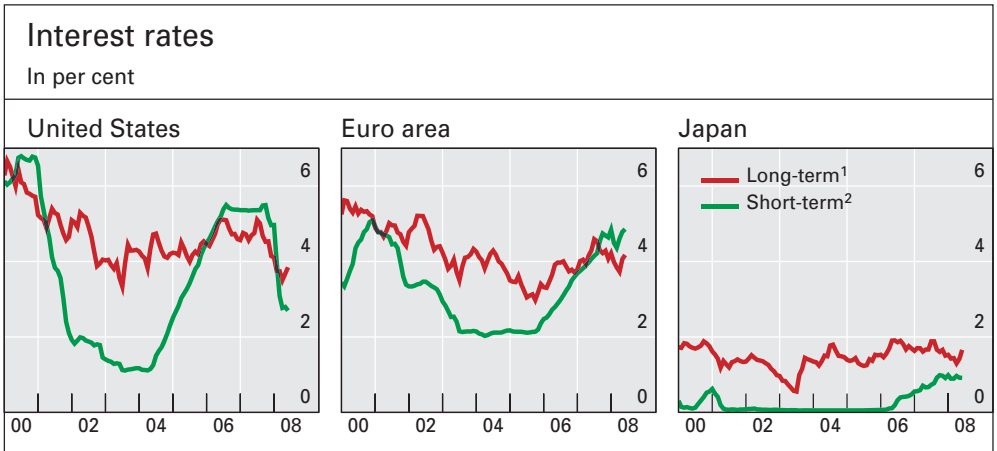
Forward-looking valuation measures fell

Declining risk appetite up to March 2008 was also evidenced by lower valuations, based on price/earnings ratios. Forward-looking valuation measures fell over the period, as downward revisions in earnings did not keep pace with the sharper decline in equity prices, despite analysts' increasing pessimism. For example, the S&P 500 fell from around 14 times one-year-ahead forecast earnings in 2006 to 13 in March 2008, its lowest level since 1995. The level in March 2008 was well below the average since 1988, but in line with averages during 1988–97, which excludes the valuation peaks of the late 1990s, a period marked by extreme optimism among equity investors (Graph VI.12, right-hand panel). Valuation measures based on the DAX and TOPIX declined as well; by March 2008 they stood well below long-term averages.

Bond yields fell sharply as the financial turmoil deepened

Bond yields tumbled ...

After seeing mostly rising long-term yields in the first half of 2007, developed country government bond markets experienced rapidly falling yields as the turmoil broke out. This strong downward pressure on yields was the result of a combination of flight to safety and expectations of lower interest rates as the outlook for economic growth deteriorated. The impact of both factors was especially evident in the United States, where the economy appeared particularly fragile. Between the local pre-turmoil peak in mid-June 2007 – which was still low by historical standards – and the Bear Stearns collapse around mid-March 2008, 10-year US government bond yields fell by almost 200 basis points to around 3.35%, a level not seen since 2003 (Graph VI.13, left-hand panel). Yields also dropped in the euro area and Japan, although to a lesser extent, reflecting perceptions that downside risks for these economies were less acute than for the United States: 10-year euro area bond yields fell nearly 100 basis points to below 3.70%, while corresponding Japanese yields declined by some 70 basis points to just below 1.30% (Graph VI.13, centre and right-hand panels). As the situation in global financial markets seemed to



[1] Ten-year government bond yield; for the euro area, German bund. [2] Three-month interbank offered rate.

Sources: Bloomberg; national data. Graph VI.13

stabilise and improve to some extent from around mid-March 2008, bond yields recovered somewhat: between mid-March and mid-May, 10-year US and euro area yields rose by around 50 basis points, while in Japan they increased by more than 40 basis points.

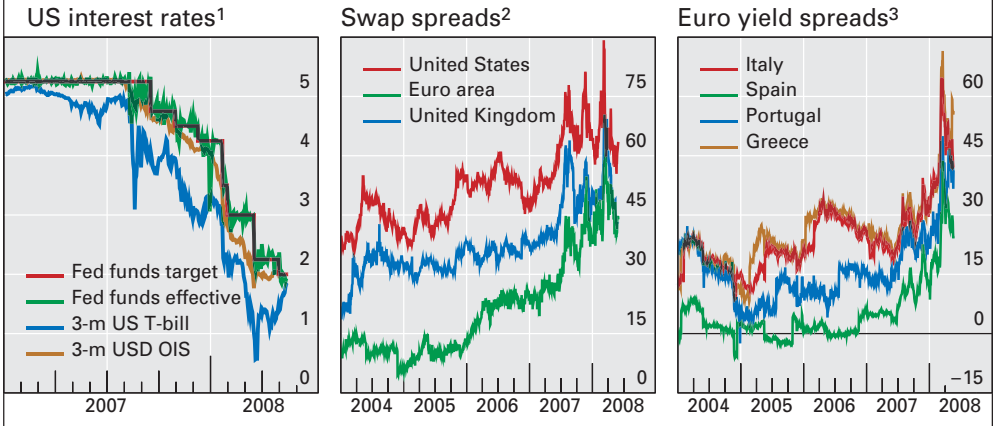
Flight to safety led to scramble for government securities

... as investors sought safe havens ...

When credit markets first started to sell off in summer 2007, investors quickly began scaling back their holdings of risky assets, leading to much higher demand for relatively safe government securities. Apart from tumbling yields, the result was a shortage of available government bills and bonds for repo transactions, particularly towards the end of 2007 and in early 2008. This shortage manifested itself in a sharp increase in the number of Treasury "fails" in the United States, ie situations in which a trade involving Treasury securities fails to settle on schedule (including both fails to receive and fails to deliver). Whereas such fails had averaged around $90 billion per week in the first three quarters of 2007, they more than doubled in the fourth quarter to over $200 billion per week, and surged further to a weekly average in excess of $700 billion in the first one and a half quarters of 2008.

The flight to safety, in combination with the rush for liquidity, resulted in a significant rise in inflows into money market funds. In the United States, for example, while total net assets in money market funds had fluctuated between $1.8 trillion and $2.4 trillion during 2000–06, they soared to more than $3.1 trillion by end-2007 and increased further to over $3.5 trillion three months later, before stabilising. With a large part of these inflows being invested in short-dated government securities, this added to the severe downward pressure on such securities, in particular US Treasury bills (Graph VI.14, left-hand panel). On occasion, the three-month T-bill traded more than 180 basis points below the corresponding expected average federal funds rate, as reflected by the three-month OIS rate. At the same time, a number of mutual funds that had invested in short-term securities related to subprime mortgages

Interest rates and spreads



[1] In per cent. [2] Ten-year, in basis points. [3] Ten-year generic government bond yields minus German generic 10-year government bond yields, in basis points.

Sources: Federal Reserve Board; Bloomberg; JPMorgan Chase; BIS calculations. Graph VI.14

were hit by the turmoil. Indeed, in some cases these funds required parent institutions to inject capital in order to prevent their net asset value from falling below par.

As the market turmoil unfolded, swap spreads widened substantially, with 10-year US, euro area and UK spreads reaching levels not seen since 2001 (Graph VI.14, centre panel). This seemed to reflect in part heightened concerns among investors about systemic risks, as fears of instability in the banking system accumulated. In addition, the rise in swap rates vis-à-vis government bond yields reflected investors' flight from risky assets into government securities, as well as increased use of swaps in an effort to hedge credit-related exposures in an environment where liquidity in traditional hedging markets was becoming increasingly scarce.

... amid falling appetite for risk ...

In yet another sign of heightened liquidity preference and lower appetite for risk, spreads between German and other individual euro area government bond yields widened to unusually high levels after mid-2007 (Graph VI.14, right-hand panel). The spread between Spanish and German 10-year bond yields, for example, rose from around 5 basis points in June 2007 to over 40 basis points in March 2008, and corresponding Italian spreads increased from about 20 to 60 basis points, before recovering somewhat by mid-May. Although some commentators attributed this widening of spreads in part to concerns about growing stresses within the monetary union linked to differences in fundamentals, it appeared more likely that the lion's share was due to investors' extreme unwillingness to hold anything but the most liquid securities available.

Recession fears drove yields further down

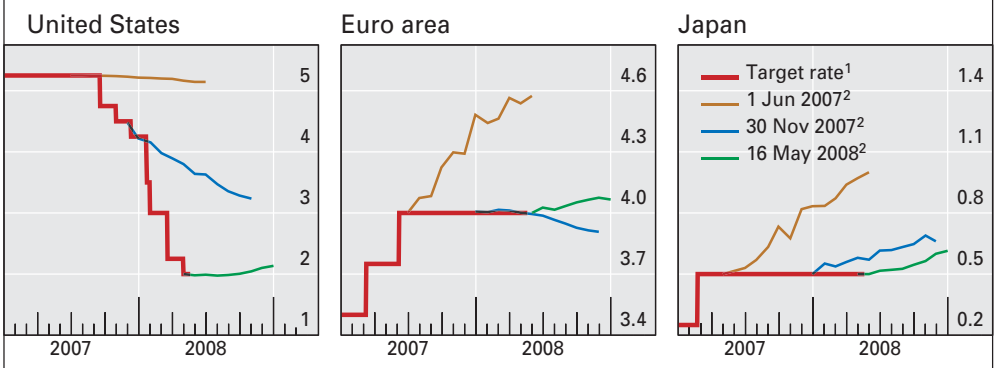
... and expectations of weakening economic growth

Perceptions of a weakening economic outlook gradually reinforced the downward pressure on yields exerted by the flight to safety. In line with this, around three quarters of the decline in long-term yields seen in the US and euro area markets for nominal bonds since mid-2007 was attributable to falling long-term real yields. Short- to medium-term real yields declined even more sharply: for example, estimated US three-year real zero coupon yields plunged by almost 300 basis points between end-May 2007 and mid-March 2008, to trade at negative yield levels (Graph VI.16, left-hand panel). This largely reflected expectations that short-term nominal interest rates would on average be lower than inflation in the United States for a number of years to come, implying a protracted period of low policy rates, presumably as a result of weak growth, coupled with lingering inflation. Short-term real yields also fell in the euro area, but substantially less than in the United States: between end-May 2007 and mid-March 2008, three-year real euro area yields fell by 130 basis points to around 0.90%. As tensions in financial markets appeared to ease to some extent, real yields also recovered somewhat between mid-March and mid-May.

Despite persistent inflation pressures, market expectations of policy rate cuts intensified as the growth outlook deteriorated, in particular in the United States. While prices of federal funds futures contracts in early summer 2007 had indicated expectations of a broadly stable monetary stance for some time – consistent with Federal Reserve signalling at the time – this picture changed

Policy rates and implied expectations

In per cent



[1] Central bank policy rate; for the United States, target federal funds rate; for the euro area, ECB main refinancing rate; for Japan, Bank of Japan uncollateralised overnight call rate. [2] Implied one-month rates; observations are positioned on the last business day of the month indicated in the legend; for the United States, federal funds futures; for the euro area, EONIA swap; for Japan, yen OIS.

Sources: Bloomberg; BIS calculations. Graph VI.15

The Federal Reserve cut rates significantly ...

rapidly as conditions in financial markets worsened (Graph VI.15, left-hand panel). By the fourth stage of the turmoil, in November 2007, the target federal funds rate had already been cut by 75 basis points, yet markets expected still more easing in the months ahead. With the situation deteriorating further at the beginning of 2008, the total additional 200 basis point target rate reduction announced by the Federal Reserve in the first quarter was even larger than had been anticipated by investors in late 2007. This, together with new measures announced by the Federal Reserve to provide liquidity to market participants, and the rescue of Bear Stearns in March, seemed to help rebuild some confidence among investors. By mid-May, following a further 25 basis point easing on 30 April, prices of federal funds futures contracts indicated expectations of a period of interest rates on hold.

... and investors expected less tight monetary policy elsewhere

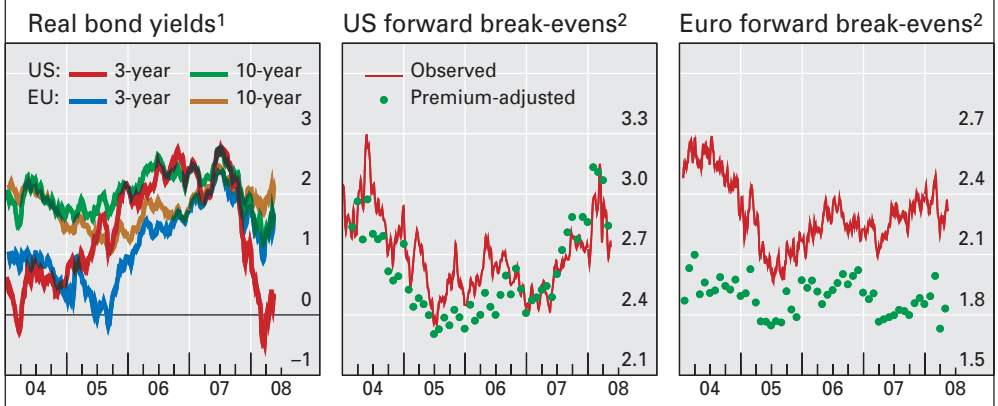
In the euro area and Japan, expected policy rates also shifted downwards as the turmoil unfolded, although, compared to US rates, investors' revisions were much more measured, as were subsequent actual policy moves. Prior to the crisis, markets had seen rates continuing to rise gradually in both the euro area and Japan (Graph VI.15, centre and right-hand panels). Perceptions that these economies were less vulnerable than the United States, in combination with central bank signalling, led market participants in the second half of 2007 to only gradually reassess their expectations for policy rates in both economies.

Break-even inflation rates rose despite a softening economic outlook

While the outlook for economic activity weakened as the financial turmoil unfolded, this seemed to have little dampening effect on inflation expectations, as measured by surveys of analysts' inflation forecasts. Part of the reason was doubtless an accelerating rise in oil prices as well as a sharp pickup in food prices, which pushed up headline inflation figures. This probably also contributed to stable and, at times, rising spot break-even inflation rates in the United States and in the euro area.

Real bond yields and forward break-even inflation rates

In per cent



[1] Estimated real zero coupon bond yields, based on prices of index-linked bonds; five-day moving averages. [2] Five-year forward break-even inflation rates five years ahead, calculated from estimated zero coupon spot break-even rates; "observed" refers to unadjusted forward break-even rates (five-day moving averages of daily values) while "premium-adjusted" refers to forward break-even rates that have been adjusted for corresponding estimated forward inflation risk premia (available at a monthly frequency). Premia are estimated using a modified version of the essentially affine macro-finance term structure model in P Hördahl and O Tristani, "Inflation risk premia in the term structure of interest rates", *BIS Working Papers*, no 228, May 2007. Estimations are based on nominal and real yields of various maturities, as well as data on inflation, the output gap and survey expectations of interest rates and inflation.

Sources: Federal Reserve Board; Bloomberg; BIS calculations. Graph VI.16

Rising forward break-even rates ...

More significantly, five-year forward break-even rates five years ahead, a common measure of inflation compensation that is less likely to be influenced by increasing oil prices and other transient shocks, rose in the United States and the euro area in the second half of 2007 and early 2008 (Graph VI.16, centre and right-hand panels). The increase was particularly pronounced for US forward break-even rates, and coincided with the Federal Reserve's 300 basis point total cut in the target federal funds rate between September 2007 and March 2008. Investors may therefore have taken the view that the Federal Reserve, and perhaps other central banks, might have to maintain a more accommodative policy stance than normal in order to contain risks to economic growth in an environment of severely strained financial markets, ie a "risk management" approach to monetary policy (see Chapter IV). As the situation in markets improved after mid-March, and expectations of further sharp rate cuts receded, break-even rates fell back from their highs.

At the same time, break-even inflation rates must be interpreted with caution. They reflect not only inflation expectations, but also various risk premia – notably for inflation and illiquidity risk – and possibly also effects stemming from institutional factors. Moreover, during times of severe market stress, technical factors such as flight to safety and rapid unwinding of trades may affect break-even rates and complicate their interpretation. Abstracting from liquidity effects and influences due to institutional and technical factors, break-even inflation rates reflect two components: expected inflation over the horizon of the break-even rate, and a risk premium related to inflation uncertainty. One can therefore try to adjust observed break-even rates for estimates of such inflation risk premia in an effort to obtain a somewhat more

accurate picture of investors' inflation expectations. Estimates of inflation premia can be obtained, for example, by jointly modelling the dynamics of nominal and index-linked bond yields together with macro variables. According to estimates from such a model, the rise in the US forward break-even rate until around mid-March seemed to be largely due to rising long-horizon inflation expectations (Graph VI.16, centre panel). By contrast, while some of the short-term fluctuations in euro area forward break-even inflation rates also appeared to reflect changing inflation expectations, the model estimates suggest that much of the increase that took place in the second half of 2007 and early 2008 was attributable to rising inflation risk premia (Graph VI.16, right-hand panel).

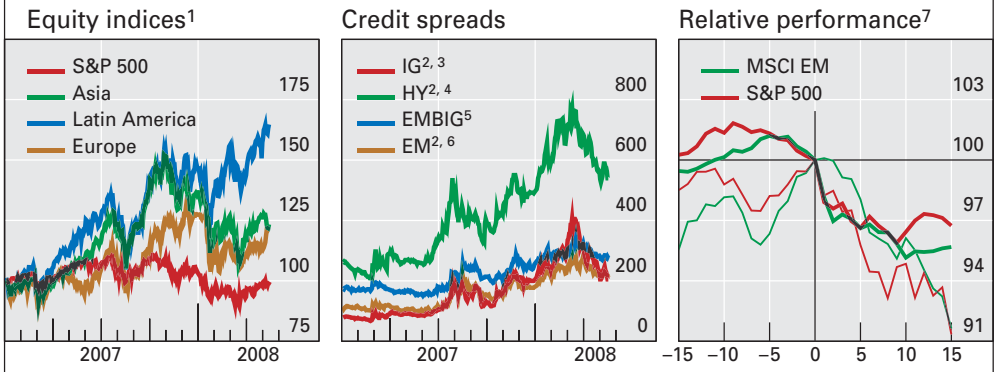
... seemed to signal higher expected US inflation

Emerging market assets showed signs of resilience

Emerging market asset values, which experienced significant growth in the first half of 2007, generally proved to be more resilient during the turmoil than those of comparable asset classes elsewhere and, indeed, than in previous episodes of market turbulence in advanced economies.

During the first half of 2007, emerging market asset prices soared, underpinned by yet another year of strong economic performance. Emerging economies continued to experience rapid growth, with surging commodity prices supporting further improvements in fiscal and balance of payments positions in many countries (see Chapter III). Despite a brief period of market turbulence in late February 2007, the JPMorgan EMBIG index of spreads on US dollar-denominated sovereign debt continued to drift lower up to mid-year, reaching an all-time low of 151 basis points in early June (Graph VI.17, centre panel). Emerging equity markets also saw strong gains, with the MSCI index up 16% by mid-year (Graph VI.17, left-hand panel).

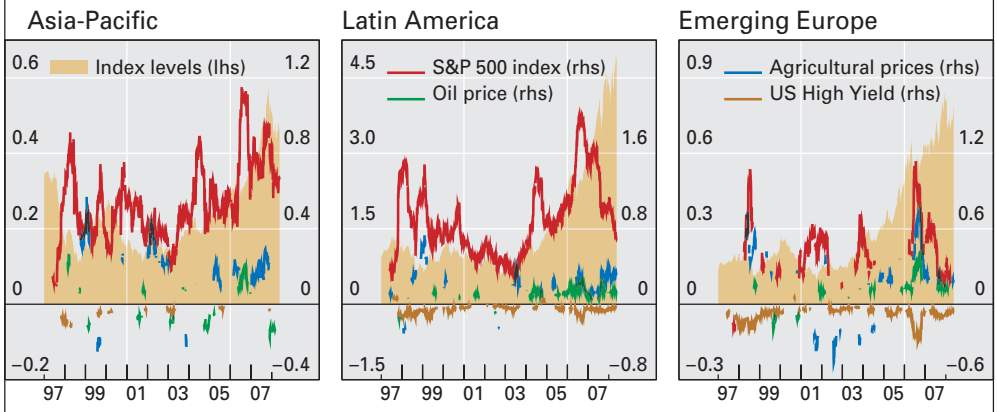
Emerging market financial indicators



[1] 3 January 2007 = 100. [2] Five-year on-the-run CDS spreads, in basis points. [3] DJ CDX IG High Volatility. [4] DJ CDX HY. [5] JPMorgan Chase EMBI Global (EMBIG) sovereign stripped spreads, in basis points. [6] DJ CDX EM. [7] Thick lines indicate the average over 11 turbulent periods, from 2000 to July 2007, where turbulent periods are defined as sudden and sustained increases in the VIX index. Thin lines indicate the average over three post-July 2007 turbulent periods, starting on 20 July, 1 November and 27 December, respectively. The horizontal axis indicates the number of trading days before and after the start of a turbulent period.

Sources: Bloomberg; JPMorgan Chase; BIS calculations. Graph VI.17

Sensitivity of emerging market equity indices to global factors[1]



[1] The lines plot the estimated coefficients from 100-day rolling regressions of the daily percentage change in the MSCI regional equity index on the daily percentage change in the S&P 500 index, the daily percentage change in the price of oil, the daily percentage change in the price of agricultural products, and the daily percentage point change in Merrill Lynch US High Yield option-adjusted spreads. Only coefficients with an associated t-statistic larger than 1.5 are plotted.

Source: BIS calculations. Graph VI.18

In line with the general repricing of risk, emerging market asset values experienced considerable swings in the second half of the year, although not as large as those observed in some mature economies. Between end-June and 26 November 2007, spreads on emerging market sovereign debt widened by 107 basis points, much less than the widening in US high-yield credit markets over the same period. Moreover, while the cost of insuring emerging market sovereign debt against default, tracked by the CDX EM index, rose during the turmoil, spreads on CDS contracts of similar maturity on some US investment grade paper rose even more. By November 2007, the CDX EM had fallen well below the high-volatility subindex of the North American investment grade CDX index (Graph VI.17, centre panel).

Emerging market assets followed global markets lower in August ...

Emerging equity markets were hit particularly hard during the initial stages of the turmoil, although they proved to be more resilient relative to markets in some mature economies during later stages. From their peak on 23 July, they gave back a large part of their gains from the first half of the year over the next month, with the broad MSCI emerging market index down 18% by 17 August, compared to a 10% decline in the global index over the same period. However, emerging market equities rebounded in September and October, boosted by particularly strong performance in Asia (24%) and Latin America (25%) during these months. By year-end, the broad indices for each of the three emerging regions were still above their 23 July levels, while the major indices for the United States, Japan and Europe had all registered declines of 4% or more.

... and in early 2008

As in advanced industrial economies, concerns over a more widespread slowdown in growth clearly began to weigh on many emerging markets in early 2008. The string of weak real side data for the United States released in January sparked a global equity market sell-off, leaving the broad emerging market index down more than 10% for the month. Spreads on emerging market sovereign debt also widened in the wake of the sell-off, with the EMBIG

ultimately reaching 339 basis points on 17 March, as news of the worsening financial distress of Bear Stearns reached the market.

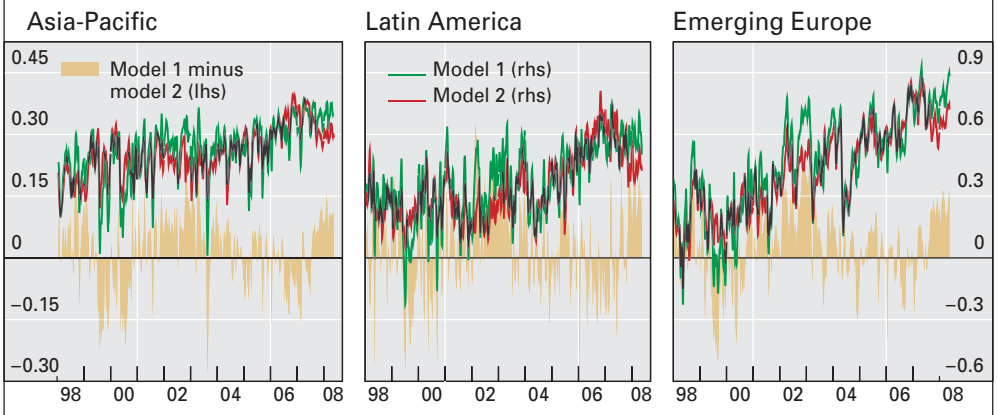
Surging commodities supported equity markets in some countries

The sharp declines in emerging equity markets in early 2008 differed significantly across countries. Rising commodity prices provided support for markets in Russia, Latin America and the Middle East but at the same time fuelled concerns about domestic inflation in all emerging regions (see Chapter III). Latin American equity markets quickly rebounded after the January sell-off, with indices in Brazil, Chile and Peru trading near their all-time highs in late March. In contrast, Asian equity markets had fallen more than 20% by mid-March, with markets in China, India and the Philippines down the most. In China, in particular, efforts by the domestic authorities to slow the economy, combined with an appreciation of the renminbi against the US dollar and rising food and oil prices, caused equity investors to question the valuations of Chinese corporates, which by late 2007 had exhibited price/earnings ratios near 50. By 18 April 2008, the Shanghai equity index had fallen by almost 50% from its 16 October 2007 peak, eliminating much of the gains achieved earlier in 2007.

Price sensitivity to US market moves has declined ...

Throughout the period of market turbulence, asset values in many emerging economies were supported by perceptions that the downside risks to growth were more limited than for the United States and other advanced industrial economies (see Chapter III). In both emerging equity and credit markets, asset prices thus exhibited a somewhat muted sensitivity to movements in US equity and credit markets relative to earlier periods. For example, in three distinct episodes of sudden and sustained increases in volatility in US equity markets since July 2007, emerging market equity prices held up relatively well, outperforming the S&P 500 during the first 15 trading

Conditional correlation between emerging market and US credit spreads[1]



[1] Model 1 tracks the time-varying correlation between the daily changes in option-adjusted spreads on the JPMorgan Chase EMBI Global Diversified index for each region and changes in option-adjusted spreads on the Merrill Lynch US high-yield index, estimated using a bivariate GARCH model. Model 2 tracks these correlations estimated with a model which controls for global factors (option-adjusted spreads on the Merrill Lynch US investment grade index, MSCI Global equity index and the S&P GSCI Commodity price index); 10-day moving average.

Sources: Bloomberg; JPMorgan Chase; Merrill Lynch; national data; BIS calculations. Graph VI.19

days in each period (Graph VI.17, right-hand panel). This stands in contrast to previous periods of turbulence in US markets, when emerging markets tended to underperform.

... in both emerging equity markets ...

In part, the resilience of emerging market assets has reflected both robust domestic growth in many countries and support from surging commodity prices. Some statistical evidence drawn from rolling panel regressions seems to confirm this observation (Graph VI.18). The sensitivity to US equity markets, which had been rising in most regions since 2003, started to wane in mid-2006, and then fell significantly after July 2007 as the financial turmoil erupted. Over this same period, the daily changes in commodity prices seemed to emerge as more important drivers of emerging equity returns, particularly in Latin America.

... and emerging credit markets

Estimates based on credit spread data provide some evidence of a similar disconnect between emerging market sovereign debt markets and those for US high-yield credit. A simple estimate of the time-varying correlation between spreads in these markets stayed at a relatively high level by historical standards, following a generally upward trend since at least 2004 (green line in Graph VI.19). However, once other US and global factors (commodity prices, global equity prices and US investment grade credit spreads) are taken into account (red line), the correlations showed a more significant drop from 2007, particularly during the recent period of credit market turmoil.