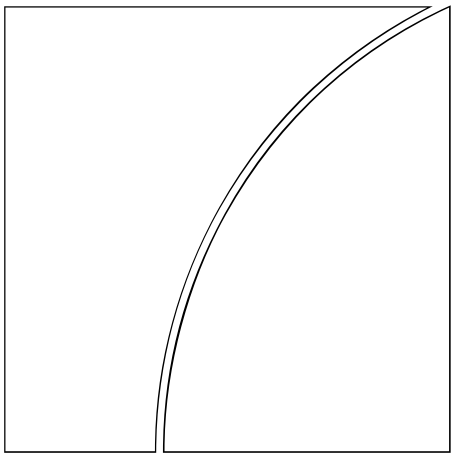
BANK FOR INTERNATIONAL SETTLEMENTS

BIS Quarterly Review

June 2002



International banking and financial market developments

BIS Quarterly Review
Monetary and Economic Department

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Special features

Notations used in this Review

e	estimated
lhs, rhs	left-hand scale, right-hand scale
billion	thousand million
...	not available
.	not applicable
–	nil or negligible
$	US dollar unless specified otherwise

Differences in totals are due to rounding.

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1. Overview: waning confidence in strong recovery

The early months of 2002 saw a waning of the anticipation of a strong recovery that had built up in financial markets during the fourth quarter. Reflecting more circumspection, stock prices declined and US long-term interest rates edged lower. Unexpectedly strong macroeconomic growth data in late February and early March led to another burst of optimism, but this too ebbed as subsequent data failed to support buoyed expectations. Rising oil prices raised the spectre of inflation in Europe and led to a rise in euro long rates. In equity markets, investors' hopes were dashed by a lack of evidence that corporate earnings were recovering in line with the economy as a whole. Share prices were depressed further by continued scepticism about corporate disclosure and accounting practices, by new reports indicating that stock analysts tended to be biased in their recommendations, and by a sudden aversion to companies seen as relying heavily on short-term debt.

The corporate bond market continued to be hospitable to most borrowers while non-financial firms came under increased pressure to reduce their reliance on short-term funding. Reluctance on the part of banks to provide backup facilities forced some firms out of the commercial paper market, while other firms tried to please their shareholders and rating agencies by reducing their use of short-term debt. Some large European firms tested the bond market for the first time as they sought alternatives to traditional bank financing. Corporate bond markets accommodated the shift by non-financial firms to longer-term funding. In a market with relatively weak net issuance, corporate spreads remained relatively narrow in the first few months of 2002.

Emerging markets benefited from the expectations of a recovery in the advanced economies. In spite of continuing economic problems in Argentina, sovereign spreads in general narrowed in an environment of low international interest rates. Still, few emerging market borrowers took advantage of the improved credit conditions. Among the best performing stock markets globally were those of Mexico, Korea and Southeast Asian countries, which were seen as having the most to gain from an economic rebound in the United States.

European long-term yields edge up on inflation concerns

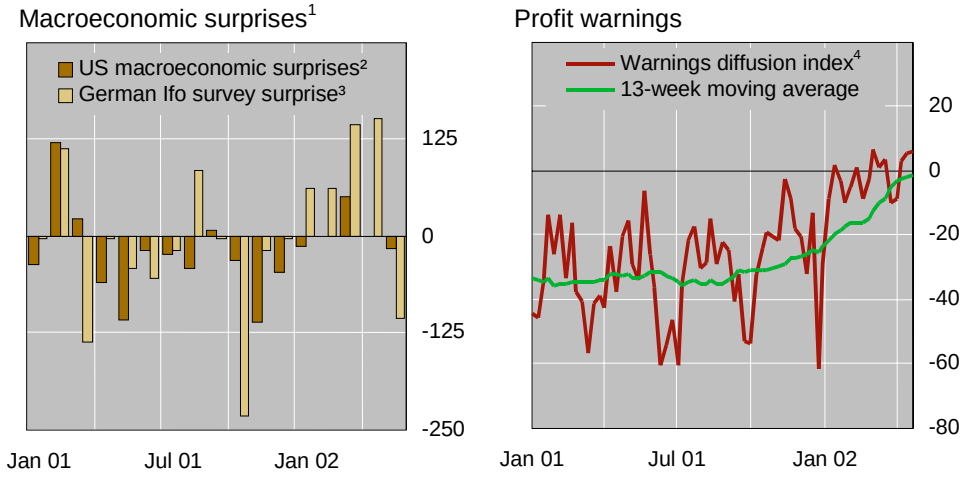
Long rates fall in the United States but rise in the euro area

The high hopes for a strong recovery, which were evident in fixed income markets in the fourth quarter of 2001, gave way to more modest expectations in the early months of 2002. While the traditionally most closely watched macroeconomic indicators tended to be more positive than in the fourth quarter of 2001 (Graph 1.1), market participants were apparently still disappointed. They seemed to focus their attention on such indicators as durable goods orders in the United States, business and consumer confidence in the euro area, and German GDP growth, which tended to fall below market expectations. Slight reflationary pressures kept long-term interest rates from falling further, and in Europe actually led to rising rates. On balance, by mid-May five-year US dollar swap rates had fallen 15 basis points from their late December highs, while euro swap rates of the same maturity had risen 25 basis points over that period (Graph 1.2).

Greenspan testimony signals stronger growth

Surprisingly strong macroeconomic data in late February and early March led to a brief bout of optimism and, for a while, sharply higher interest rates. Market participants appeared to be especially surprised by the large upward revision in US fourth quarter GDP, released on 28 February, showing growth of 1.4% at an annual rate. Federal Reserve Chairman Greenspan's Senate testimony on 7 March, in which he gave a much more upbeat assessment of US economic prospects than he had in testimony just a week earlier, had an even more pronounced impact on long-term rates. On that day alone, major currency swap curves shifted markedly higher; the five-year US dollar rate rose 20 basis points and the euro rate 8 basis points. Market participants increased their expectations for both long-term economic growth rates and near-term

Closely watched public information

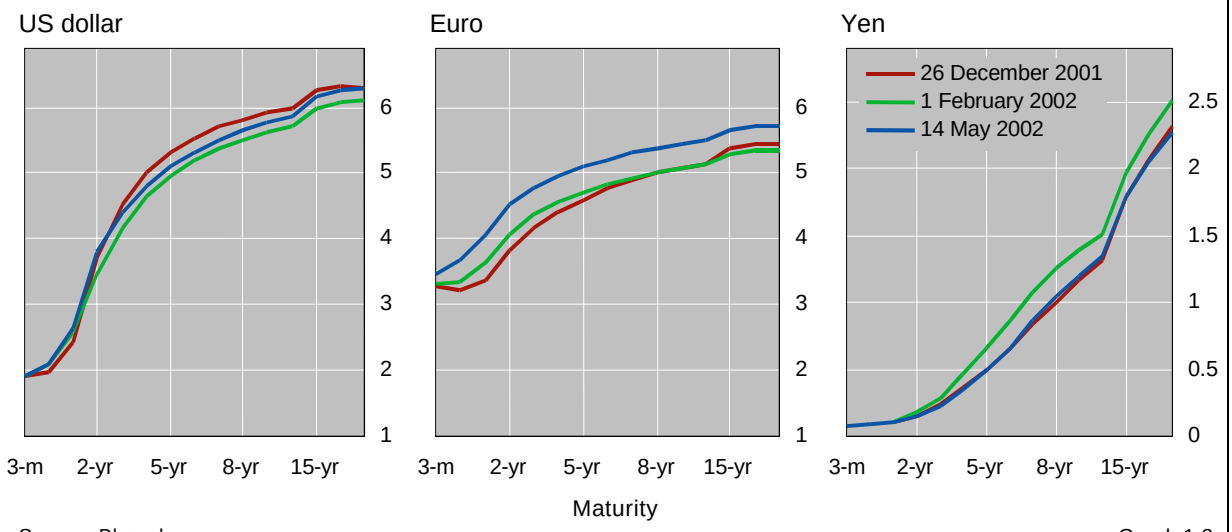


[1] Normalised announcement surprises (with unit variances), based on the difference between released numbers and consensus forecasts. [2] Weighted sum of normalised surprises of ISM survey, non-farm payroll, retail sales, producer price and consumer price announcements. [3] The German Ifo survey is a business climate index derived by the Institut für Wirtschaftsforschung from survey responses. [4] Number of positive minus negative warnings as a percentage of number of positive plus negative profit warnings.

Sources: Bloomberg; BIS calculations. Graph 1.1

Yield curves for interest rate swaps

In percentages



Source: Bloomberg.

Graph 1.2

monetary tightening. From 27 February to 25 March, when policy rate expectations implied by interest rate futures peaked, swap curves both flattened and moved higher. The shift in investors' expectations about policy rates pushed up two-year swap rates by 82 basis points in dollars and 43 basis points in euros, while the respective 10-year swap rates climbed 55 and 27 basis points.

March and April also witnessed the removal of residual expectations of disinflation from long rates. Although markets apparently had difficulty predicting the strength of the economic recovery, they appeared convinced that the disinflationary pressures of the economic slowdown had passed. Rising oil prices also suggested increasing price pressure. A jump in 10-year swap rates in March coincided not only with the surprising strength of macroeconomic indicators but also with soaring oil prices (Graph 1.3, left-hand panel). While the anticipation of increased global demand for energy pushed commodity prices higher, the rise in crude oil prices and their volatility corresponded with increasing political disturbances in the Middle East and in Venezuela.

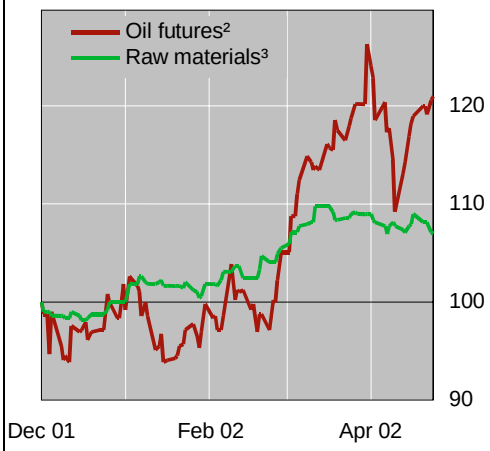
As bond investors watch German wage negotiations ...

Market participants viewed Europe as being particularly exposed to inflationary pressures. European reliance on imported oil and commodities was one factor, but concern over labour costs was another. Germany's powerful IG Metall labour union staged a strike in early May and market participants and European policymakers alike worried about the final outcome of their wage negotiations. Significantly, at the 2 May press conference, European Central Bank President Duisenberg said that while he still expected European inflation to be close to 2%, he could no longer confidently predict that it would be below that level.

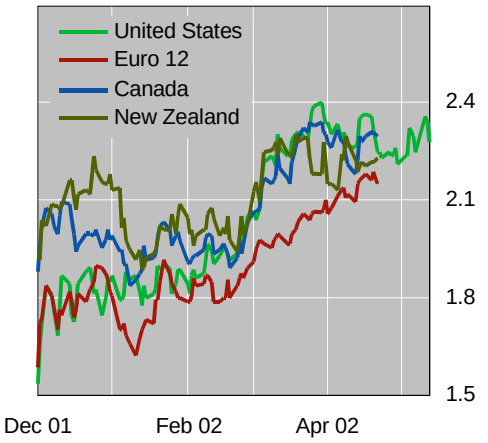
The rising inflation component of long-term interest rates is evident in the behaviour of yields on inflation-linked government securities. Implied inflation

Commodity prices and implied inflation compensation

Oil and raw materials prices[1]



Inflation compensation[4]



[1] 1 December 2001 = 100. [2] Price index based on December 2002 futures contract for Brent crude oil. [3] Moody's raw materials price index [4] Difference between a plain vanilla sovereign issue and an inflation-linked issue of similar maturity (for the United States and the euro area, 10-year notes, for Canada 20-year notes and for New Zealand 14-year notes).

Sources: Bloomberg; BIS calculations. Graph 1.3

... inflation compensation in French bonds increases

compensation, the difference between the yield of a plain vanilla sovereign issue and that of an inflation-linked issue of similar maturity, began to increase in late February as yields on nominal issues rose faster than the "real" yields on inflation-protected notes (Graph 1.3, right-hand panel). While differing tax treatment and thin trading tend to make the *levels* of yields on such inflation-indexed notes poor measures of real interest rates, significant *changes* in their yields are often informative about expectations. In March, much of the rise in inflation compensation paralleled the hike in oil prices. The French inflation-linked bond is indexed to inflation in the 12 countries of the euro zone. The implied compensation for this bond increased by 15 basis points in March. It is also worth noting that implied compensation in Canada and New Zealand did not fall after those countries' central banks proactively raised policy rates in March and April; in fact, Canadian inflation compensation continued to rise.

In Japan, long rates fall as fears over the budget deficit recede

Japanese interest rates were also unusually volatile throughout the first four months of the year and appeared to move to a different beat than those in other industrial countries. From late December to early February, while US dollar and euro interest rates were falling, Japanese 10-year swap rates rose more than 20 basis points. Discouraging macroeconomic data and little progress in the resolution of Japanese banks' bad assets seem to have raised expectations of future government borrowing needs and increased selling pressure on Japanese government bonds in early 2002. In late February and early March, however, yen interest rates began to fall, nearly returning to their December lows by early April. The decline in rates coincided with a rally in Japanese share prices and an appreciation of the yen. At the end of February, the Bank of Japan announced that it would increase purchases of Japanese government bonds by 25%; two weeks later the Ministry of Health, Labour and

Welfare signalled its intention to increase purchases of domestic sovereign debt.

Corporate borrowers come under pressure to go long-term

Investors, banks and rating agencies exert pressure

Non-financial corporate borrowers faced increased pressures to shift from short-term to long-term debt. The pressures came from shareholders of large firms, from investors in the commercial paper (CP) market, from banks providing CP backup facilities and from credit rating agencies. Even borrowers that had managed to maintain high credit ratings felt the pressure to "term out." Some of those forced out of the CP market turned to the corporate bond market, where long-term borrowing costs remained relatively attractive (Graph 1.4). In Europe, several large firms that had traditionally relied on short-term bank loans also turned to the corporate bond market.

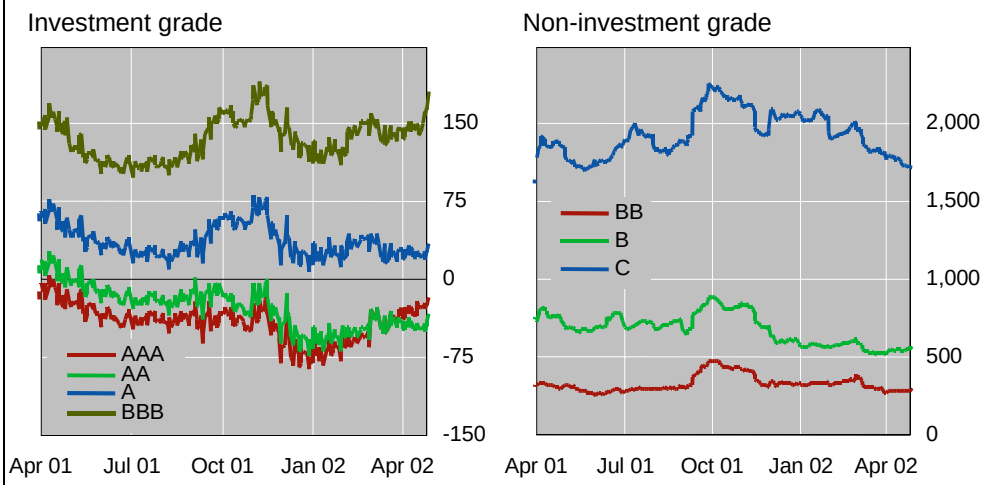
Highly rated firms are not immune

Shareholders of large firms exerted their own brand of pressure. Reacting to headlines about the funding difficulties of several high-profile corporations, investors punished the stock prices of other large firms seen as relying excessively on short-term funding. Even triple-A rated firms were not immune. In late March, share prices of one such highly rated firm, General Electric, fell sharply after the manager of a large US fixed income fund took issue with the firm's reliance on CP borrowing and the lack of complete backup liquidity lines for such debt.

The pressure to shift out of short-term debt was especially intense for low-rated borrowers in the CP market. As in most of 2001, investors in this market were hostile to all but the most creditworthy borrowers. In the early months of 2002, this hostility spread to more borrowers as rating agencies extended the

Investment and non-investment grade corporate bond spreads[1]

In basis points



[1] Ten-year bond index yields against swap yields.

Sources: Bloomberg; Merrill Lynch; BIS calculations. Graph 1.4

list of downgraded credits. The largest buyers of CP have been money market mutual funds, and it is critical for these funds that they do not "break the buck", that is, that they preserve their investors' principal. To this end, a 1991 rule by the US Securities and Exchange Commission limits the funds' holdings of non-prime CP to 5% of their portfolios. It may be that recent defaults in the CP market have led the funds to hold even less non-prime paper than the rule allows.

Banks withdraw backup facilities

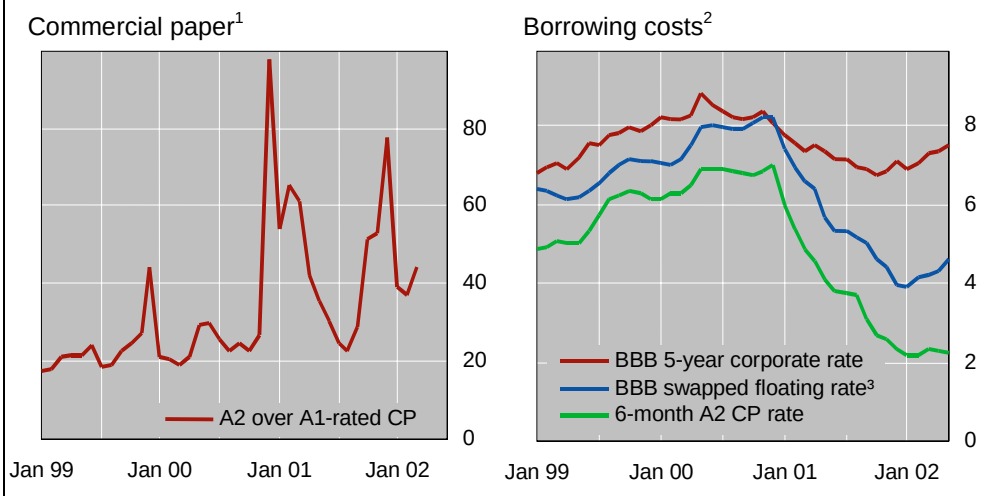
More significantly, banks began to carry out an earlier threat not to provide backup liquidity facilities for CP borrowing unless fees were raised substantially. On 29 April, JP Morgan Chase, by far the largest provider of such facilities, announced to potential borrowers that it was pulling back from the business. The irony of these moves was that these standby facilities were created in the 1970s to relieve funding problems in a CP market that was prone to seizing up. In 2002, with these backup facilities having effectively become requirements for CP issuance, the withdrawal of such facilities by large banks only added to the difficulties of the CP market.

Borrowers turn to corporate bonds ...

Those turned away from the CP market found other ways to raise funds. Some turned to the corporate bond market, where even borrowers whose A2/P2 short-term debt ratings now excluded them from the CP market found that their triple-B long-term debt ratings still appealed to bond investors. In a market where net issuance was relatively weak (see "The International debt securities market" on page 23), 10-year triple-B corporate issues required spreads averaging only about 136 basis points during the first four months of 2002, compared to 152 basis points during the fourth quarter of 2001.

US commercial paper spreads and borrowing costs

Monthly averages



[1] On 30-day yields, in basis points. [2] In percentages. [3] Three-month US dollar Libor rate plus spread between BBB-rated corporate bond yield and 5-year US dollar swap rate.

Sources: Bloomberg; Merrill Lynch; Datastream; BIS calculations. Graph 1.5

Other firms may have turned to the asset-backed CP (ABCP) market, in which the use of receivables as collateral would ensure the issue received a high credit rating. By April 2002, the ABCP market had grown to $723 billion in outstanding amounts, compared to $658 billion in the unsecured CP market.

In spite of the attractive corporate spreads, a relatively steep yield curve meant that firms paid a hefty premium to shift from short-term to long-term debt. At end-March 2002, for example, a triple-B US dollar borrower would have had to pay a fixed rate of about 7.5% for a five-year corporate issue. Having lost access to the CP market, the same borrower would still be able to borrow at a short-term rate by obtaining a swap contract that would allow it to exchange fixed rate payments for floating rate ones. The swapped short-term rate would have been about 4.4%, or 3.1% less than the fixed rate (Graph 1.5). Indeed, a number of large issuers in the US corporate bond market were reported to have swapped into floating. Spreads of five-year swap yields over US Treasury yields narrowed by 22 basis points during the first four months of 2002, in part because of such credit arbitrage transactions.

... but some swap back into floating

The ability of borrowers to swap from fixed to floating rates provides a way to assess difficulties in the CP market. The difference between a quoted A2/P2 CP interest rate and the corresponding swapped floating rate is a rough measure of the cost of the restricted access to the CP market. Fees for back-up liquidity lines would amount to 10 to 20 basis points, thus accounting for only a fraction of that difference. This interest differential rose from 1.3% at the beginning of 2002 to 2.3% by the end of April, suggesting that difficulties in the CP market worsened.

Profit warnings and accounting issues abort rally in equity market

Investors are concerned about weak corporate earnings ...

Stock markets witnessed the same seesawing confidence as fixed income markets but declined on balance in most industrial countries. Equity markets were particularly affected by the lack of evidence that earnings were recovering with the economy as a whole. Negative profit warnings continued to outnumber positive ones, although the gap has narrowed significantly since 2001 (Graph 1.1, right panel). Concerns about the reliability of corporate disclosure and accounting practices, as well as new scandals involving conflicts of interest among securities dealers, led to increasing wariness throughout early 2002 among equity investors and exerted downward pressure on share prices. Investors punished especially the stocks of companies that offered relatively complicated or opaque financial statements and those thought to be borrowing excessively in the money markets.

The equity rally that had begun in October 2001 stalled in January 2002 on concerns, induced by the collapse of Enron, about the reliability of corporate financial statements. Share prices began to rise again in late February and early March following strong macroeconomic data releases (Graph 1.6). The above-mentioned revision to US fourth quarter GDP had its strongest effect on the stock market, with the S&P 500 rising by 2.3% on that day. The gains proved short-lived, however. By the second week of March, profit warnings by

bellwether technology firms, such as Lucent and Nokia, had sent equity valuations tumbling. The warnings also renewed questions about the sustainability and strength of an economic recovery without corporate profits and a resumption of fixed investment.

... and about bad accounting and biased analysts

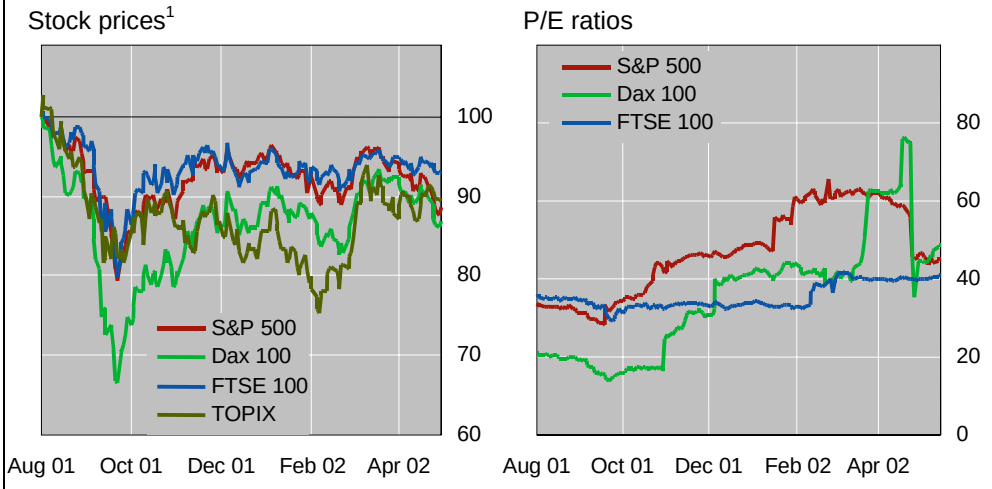
News in late March that several high-profile technology firms were having their accounting methods examined by the US Securities and Exchange Commission added to the slide of share prices as anxiety over corporate disclosures resurfaced. The coincident news of investigations into the practices of some prominent Wall Street brokerage analysts deepened the unease of equity investors. As a consequence, broad equity index declines were particularly steep from 19 March to the end of April, when the S&P 500 fell by 8%, the FTSE 100 by 4% and the Dax by 7%.

The mistrust of corporate disclosures contributed to a divergence between the performance of large capitalisation and small capitalisation stocks. During the above period, the Dow Jones Industrial Average, representing the largest companies in the United States, fell by 6%, while the Russell 2000 index of small and mid-capitalisation stocks rose 5% (Graph 1.7). Smaller firms reportedly benefited from a simplicity or lack of complication in their business, bookkeeping and financial transactions. There was also a perception among many market participants that the small companies might benefit more from an economic recovery than the larger corporations, because they rely more on internal cash flows to finance investments.

In Japan, an uptick rule supports the stock market

The Japanese stock market seemed to move in tandem with broader yen asset prices, often at odds with perceptions of the underlying prospects for the Japanese economy. Shares on the TOPIX rallied with Japanese debt markets, rebounding sharply in late February and early March. The reflation of Japanese asset prices and the coincident appreciation of the yen prior to 31 March

Stock markets: prices and earnings



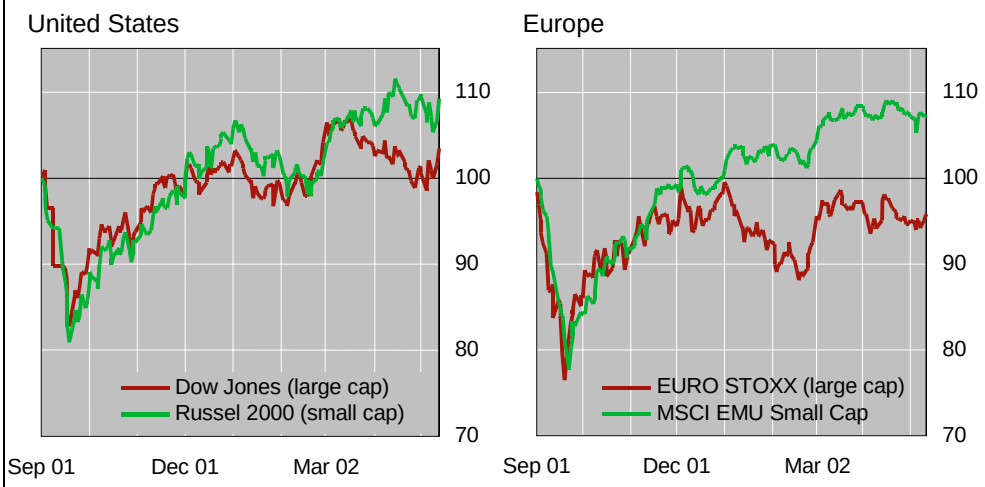
[1] 1 August 2001 = 100.

Sources: Datastream; Bloomberg; BIS calculations.

Graph 1.6

Large and small capitalisation stock market indices

1 September 2001 = 100



Sources: Bloomberg; Datastream. Graph 1.7

led some market participants to attribute the moves to corporate window-dressing of balance sheets at the end of the Japanese fiscal year. Some observers attributed the equity market rally to the fact that a large construction firm was allowed to fail, sending a favourable signal about a shift in the official attitude towards corporate restructuring. Other observers considered the imposition of a so-called "uptick rule" to be the more important factor. This rule prohibits a short sale of stocks without a prior increase in the stock price. Numerous market participants were reportedly short in Japanese equities when the rule was implemented and there was some confusion prior to the announcement about how the order would "punish" short sellers. The short covering of some nervous market participants reportedly pushed up prices enough to require others to liquidate their short positions, with the effects becoming mutually reinforcing.

Emerging markets join the recovery

Emerging markets gained markedly from the expectations in early 2002 of a recovery in the global economy. In spite of continuing economic problems in Argentina, sovereign spreads in general narrowed in an environment of low industrial country interest rates. Some of the strongest performing stock markets were those of Korea, Mexico and Southeast Asian countries, which were seen as having the most to gain from an economic rebound in the United States (Graph 1.8). The Russian equity market continued to rise at a blistering pace, with recent increases in oil prices adding impetus to the improving business climate.

Strong performance by Korean, Mexican and Russian stocks

Asia's newly industrialised economies were aided by expectations that recovery in the United States, even if subdued, would raise export demand. By the end of April, share prices in Seoul had risen 22% since the start of the year

and had doubled in value from their September 2001 lows. A surprisingly strong revival of global consumer demand for electronic products combined with improving domestic demand helped Korea's economy stand out in the region. Korea also received an unprecedented two-notch upgrade to its sovereign credit rating from Moody's in late March, which led to a small rally in both its stock markets and its external debt. Other Asian countries' equity returns were also high over the period, even if not matching those in Korea.

Moody's upgrades Korea

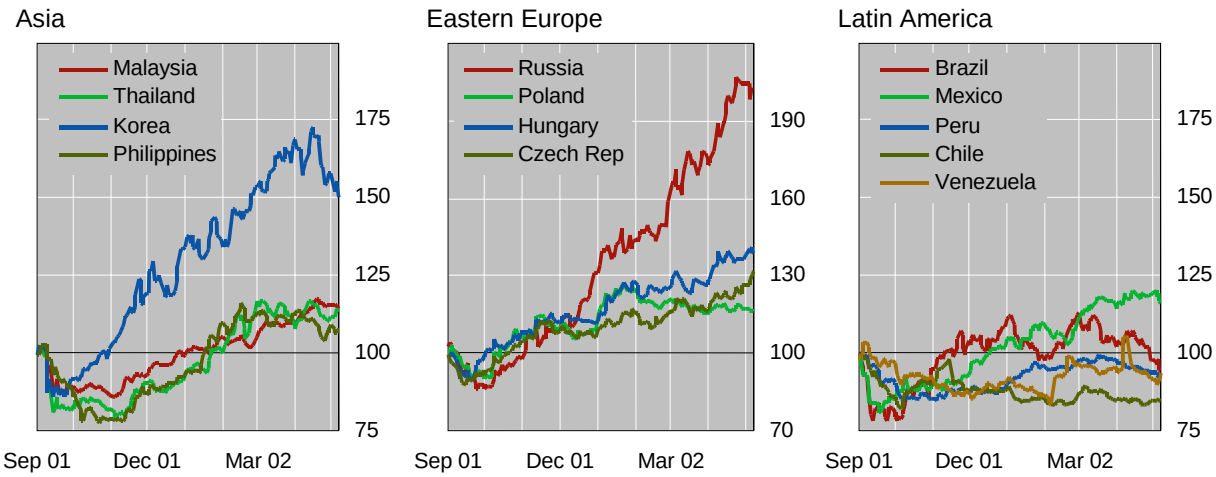
The performance of Mexican financial assets continued to diverge from that of financial assets in the rest of Latin America. Despite several consecutive quarters of economic contraction as its most important trading partner's economy slowed, Mexico continued to be the beneficiary of expectations for a return to growth in the United States. Mexico too had its external sovereign rating upgraded by rating agencies. By early May, the Mexican stock exchange had risen by 14% since the start of 2002, and Mexico's sovereign bond spread had tightened nearly 50 basis points (Graph 1.9). Other Latin American economies languished after a brief rally following the Argentine default and devaluation. In Brazil, investors became increasingly worried as the economy continued to slow and a populist running on an agenda unfriendly to markets increased his lead in presidential opinion polls. The Brazil Bovespa stock index, having risen strongly after Argentina's default, fell on net by nearly 11% between January and May; likewise, Brazil's sovereign spread widened by 200 basis points to almost 900 basis points.

Elections in Brazil worry investors

Russia, whose financial markets were unfazed throughout 2001 despite falling global economic activity and oil prices, continued to boom in the first quarter of 2002. Shares on the Russian stock exchange have risen almost 60% this year, and the country's sovereign spread has dipped below 500 basis points, less than four years after its sovereign default.

Stock market indices in selected emerging economies

1 September 2001 = 100

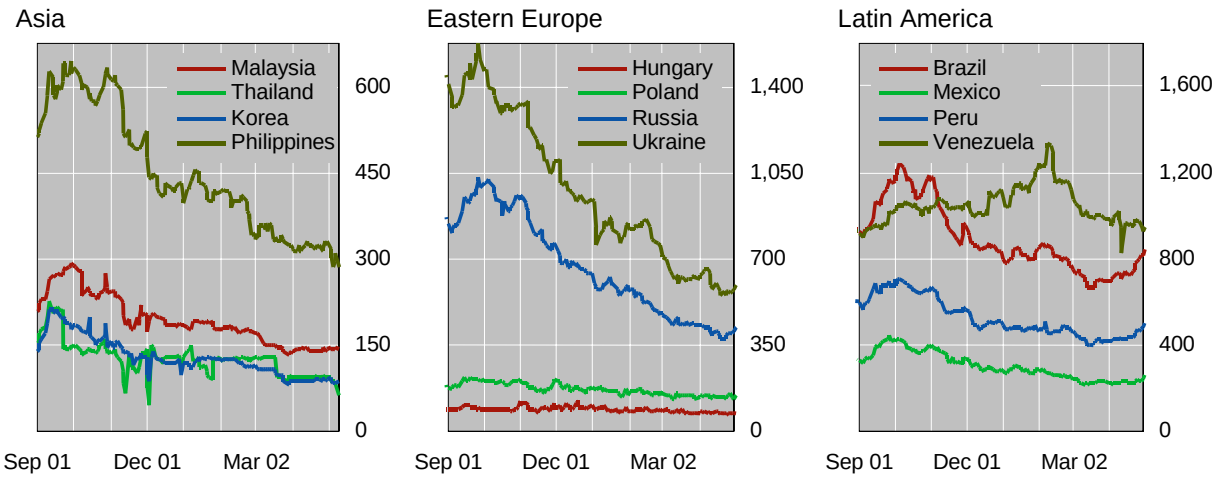


Sources: Bloomberg; national data.

Graph 1.8

Spreads of US dollar sovereign bonds over US Treasury securities for selected emerging economies

In basis points



Source: JP Morgan, *Emerging Market Research*.

Graph 1.9

Emerging markets were aided by both the low level of industrial country interest rates and narrow sovereign spreads (Graph 1.9). The low industrial country interest rates helped emerging market central banks to ease monetary policy without depressing exchange rates. Both Mexico and Korea were able to cut domestic policy rates and have their currencies appreciate. In addition, low interest rates are likely to have lowered the perceived risks of investing in emerging market assets. International issuance of debt securities by emerging market countries remained at the depressed level of recent years but, as discussed in “The international banking market” and the box on syndicated credits, Asian countries did begin to draw on bank credits from abroad in both the fourth quarter of 2001 and the first quarter of 2002.

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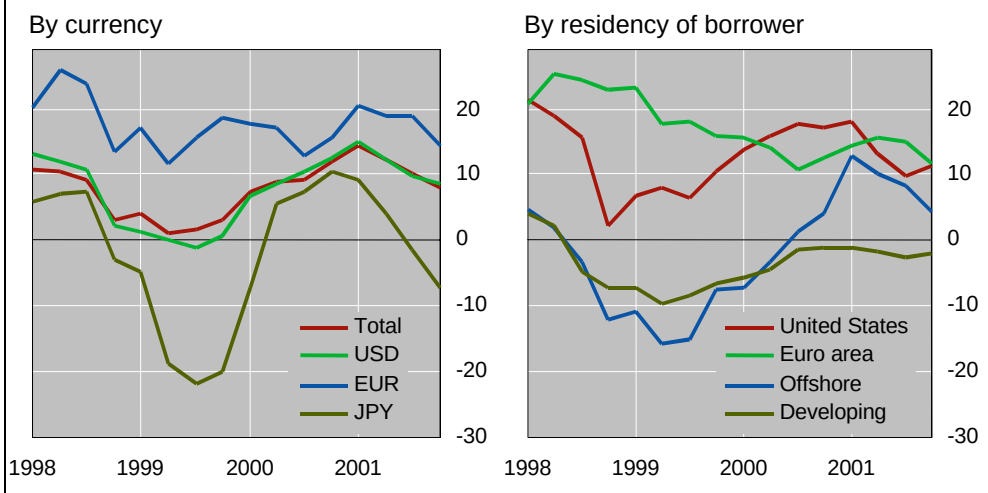
2. The international banking market

In the fourth quarter of 2001, the global economic slowdown continued to depress activity in the international banking market. The growth rate of cross-border bank credit slowed further to 8% year over year in the fourth quarter, down from a peak of 14% in the first. Inter-office transfers and increased purchases of US securities supported activity in the dollar market. However, activity in the euro and yen markets remained weak. Indeed, in Europe subdued corporate demand for bank credit and efforts by firms to reduce their reliance on short-term debt resulted in the first quarterly contraction in cross-border euro claims since European monetary union.

In emerging economies, inflows from banks in the reporting area picked up for the second consecutive quarter. Claims on Southeast Asia increased for the first time since the financial crisis there. Net flows to northern Asia and oil-exporting countries were also positive, although this was because of a withdrawal of deposits from banks abroad rather than a rise in lending. Banks increased their claims on Russia and other eastern European borrowers during the fourth quarter but reduced their exposure to Argentina. At the same time, to meet their need for dollar liquidity, banks in Argentina repatriated record amounts of funds placed abroad.

Cross-border claims of BIS reporting banks

Annual percentage changes



Graph 2.1

Securities purchases boost claims on the United States

International banking activity continues to decelerate ...

After adjusting for exchange rate movements, cross-border claims of banks in the BIS reporting area increased by $211 billion between end-September and end-December 2001, to $11.5 trillion (Table 2.1). While this is a turnaround from the declines recorded in the previous two quarters, activity in the fourth quarter is typically stronger than in other periods because inter-office business tends to rise towards the end of the calendar year. On a year-over-year basis, activity in the international banking market continued to decelerate (Graph 2.1, left-hand panel).

... despite an increase in claims on the United States

The growth of cross-border claims on the United States picked up modestly in the fourth quarter, accelerating to 11% year over year from 10% in the third quarter (Graph 2.1, right-hand panel). This pickup reflects both large inter-office flows and increased purchases of US securities. Following its acquisition of a US branch, a UK bank shifted some dollar positions from the United States to the United Kingdom, thereby boosting interbank claims on the United States. Claims on non-bank borrowers located in the United States increased by $34 billion, 70% of which was in the form of securities. Banks in Japan were the single most important source of cross-border funding for US non-banks. According to data from the US Treasury, Japanese residents purchased record amounts of US bonds in the fourth quarter, mainly US Treasury securities. Banks in the euro area also extended significant amounts of credit to US non-banks in the fourth quarter.

Despite the rise in claims on the United States, activity in the dollar market continued to slow, falling to 9% year over year in the fourth quarter from 10% in the third (Graph 2.1, left-hand panel). The pickup in flows to the United States was offset by weak dollar flows to offshore centres. In fact, US and European banks transferred large amounts from their offices in the Bahamas and the Cayman Islands to their subsidiaries in London, resulting in a substantial outflow of dollars from the Caribbean to the United Kingdom.

Bank lending to European corporations slows

Banks unwind euro-denominated interbank positions ...

The growth of the euro market decelerated further in the fourth quarter of 2001, falling to 15% year over year from 19% in the third quarter (Graph 2.1, left-hand panel). Indeed, in the fourth quarter cross-border euro-denominated claims contracted for the first time since European monetary union, by $21 billion (Table 2.1). Interbank lending, in particular lending between unaffiliated banks (as opposed to inter-office transfers), fell by even more, as banks in the euro area unwound their cross-border positions on each other and on banks in the United Kingdom. Interbank loans typically have short maturities, and so this unwinding process contributed to a significant drop in banks' international claims with a remaining maturity of one year or less, to 50% of consolidated claims on euro area residents in the fourth quarter from 52% in the third.[1]

[1] "BIS consolidated international banking statistics for the fourth quarter of 2001", BIS Press Release 11/2002E, 8 May 2002.

Cross-border claims of BIS reporting banks

Exchange rate adjusted changes in amounts outstanding, in billions of US dollars

	2000	2001	2000	2001				Stocks at end-Dec 2001
	Year	Year	Q4	Q1	Q2	Q3	Q4	
Total claims	1,194.9	850.9	393.2	733.4	–90.0	–3.4	210.9	11,482.7
By instrument								
Loans and deposits	734.0	617.2	309.0	605.3	–96.4	–42.4	150.7	8,752.6
Securities[1]	460.9	233.7	84.1	128.1	6.4	39.0	60.2	2,730.2
By currency								
US dollar	513.2	405.0	210.3	231.1	–11.1	6.5	178.5	5,215.9
Euro	432.4	433.4	66.4	400.2	5.0	48.7	–20.5	3,282.8
Japanese yen	94.7	–65.2	61.5	–6.0	–14.8	–52.4	8.0	715.2
Other currencies[2]	154.7	77.6	55.0	108.1	–69.2	-6.2	44.8	2,268.8
By sector of borrower								
Banks	907.5	388.1	348.2	458.5	–161.8	–27.2	118.6	7,554.8
Own offices	408.3	444.9	159.0	185.3	–65.5	92.8	232.3	3,794.6
Non-banks	287.5	462.8	45.0	274.9	71.9	23.9	92.2	3,927.9
By residency of borrower								
Developed countries	1,132.9	794.2	326.8	662.3	–53.5	–2.3	187.8	8,900.1
Europe	810.6	556.0	228.3	525.3	–38.5	–4.5	73.7	5,773.6
Intra-euro area[3]	144.9	169.6	19.6	118.3	32.5	12.2	6.5	1,405.8
Japan	–12.0	–23.7	39.4	–1.6	–25.1	–24.8	27.9	517.1
United States	309.2	233.8	40.9	129.5	13.6	19.4	71.2	2,335.8
Offshore centres	51.5	55.6	66.5	50.5	–26.5	7.2	24.4	1,469.7
Emerging economies	–11.7	–19.4	–5.8	2.7	–8.6	–11.2	–2.2	865.8
Unallocated[4]	22.3	20.6	5.7	18.0	–1.3	3.0	0.9	247.1
Memo: Local claims[5]	198.5	93.9	17.6	122.0	–31.5	3.7	-0.3	1,564.7

[1] Mainly debt securities. Other assets account for less than 5% of total claims outstanding. [2] Including unallocated currencies. [3] Euro-denominated cross-border claims of reporting banks domiciled in the euro area on residents of the euro area. [4] Including claims on international institutions. [5] Foreign currency claims on residents of the country in which the reporting bank is domiciled.

Table 2.1

The contraction of euro interbank lending mainly reflects the economic slowdown in the euro area in the second half of 2001 and the consequent weakening of corporate and household demand for bank credit. In addition, loan demand was depressed by euro area firms' bond-financed redemption of short-term bridge loans taken out in 2000 and 2001 to support mergers and acquisitions and purchases of third-generation mobile telephone licences.[2] Euro area corporations, including telecoms, raised substantial amounts in domestic and international bond markets in the fourth quarter of 2001, and used part of these proceeds to pay down their short-term debt. In both the US dollar and euro markets, non-financial corporations have steadily reduced their reliance on short-term debt since late 2000, a development most apparent in

... as firms pay down their short-term debt

[2] European Central Bank (2002): "Financing and financial investment of the non-financial sectors in the euro area up to the third quarter of 2001", *ECB Monthly Bulletin*, March, pp 12–15.

securities markets but which also had an impact on loan markets (see "Overview" on page 1).

Despite weaker corporate demand for bank credit, the growth of cross-border claims on euro area non-banks remained stable in the fourth quarter, at 14% year over year. In absolute terms, claims on euro area non-banks increased by $35 billion. Lower lending and investment flows to corporations appear to have been offset by increased cross-border flows to governments. Banks domiciled in Belgium accounted for nearly one third of the increase in claims on euro area non-banks during the fourth quarter, and all of this amount was invested in government securities. According to the consolidated international banking statistics, Belgian banks' claims on public sector borrowers increased to 34% of their international claims on the euro area at end-December 2001 from 29% at end-September.

Bank consolidation reduces yen interbank lending

Yen interbank claims contract further ...

In the yen segment of the international banking market, activity continued to weaken. Although yen-denominated cross-border claims increased by $8 billion in the fourth quarter, this increase was much smaller than is usual towards the end of the calendar year; on a year-over-year basis, claims contracted by 7% (Graph 2.1, left-hand panel). Interbank claims contracted by even more, as banks in Japan further reduced their yen claims on non-residents. As in the third quarter, consolidation in the Japanese banking sector partly explains the repatriation of yen funds to Japan. For example, one Japanese bank closed its office in Hong Kong SAR and shifted positions back to Japan. Some foreign banks shifted yen positions from their offices abroad to their offices in Tokyo.

... even as yen lending to non-banks and emerging markets picks up

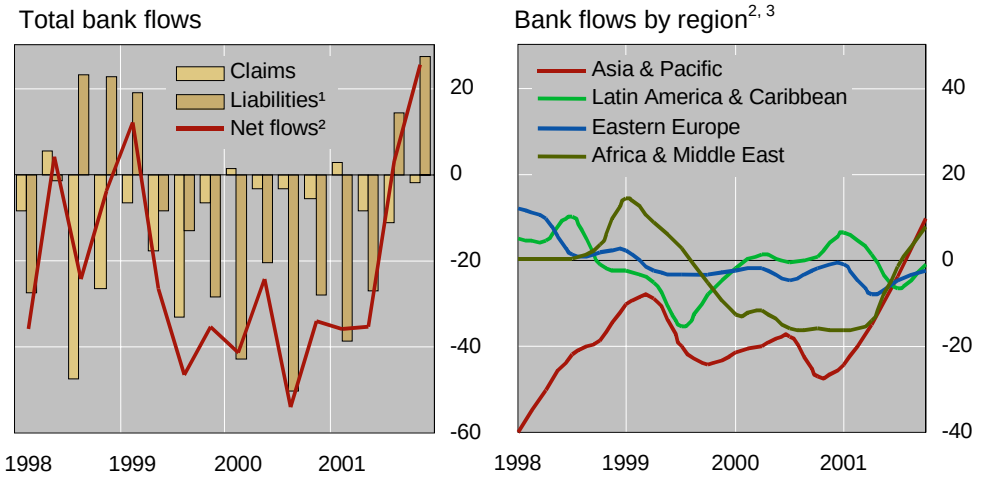
Yen-denominated claims on some borrowers did increase in the fourth quarter. Yen claims on non-banks increased by $17 billion, boosted by lending to non-banks in the United States. Yen claims on emerging economies also grew rapidly, rising by $2 billion in the quarter and by 14% for the year as a whole. Nevertheless, at end-December 2001 yen claims accounted for only 4% of the outstanding stock of cross-border claims on emerging economies, compared to 54% for the US dollar and 14% for the euro.

Withdrawals boost bank flows to emerging economies

Despite the growth of yen-denominated claims, cross-border bank claims on emerging economies continued to contract, down by $2 billion in the fourth quarter and by 2% from their level a year ago. More noteworthy, however, was the sharp drop in banks' liabilities to emerging economies. After depositing $249 billion with banks in the reporting area between mid-1999 and mid-2001, residents of emerging economies withdrew $42 billion from those same banks in the second half of 2001 (Table 2.2). This resulted in substantial flows from banks in the reporting area to emerging economies for the first time in nearly three years (Graph 2.2, left-hand panel). Bank flows to all regions other than

Banks' external positions vis-à-vis emerging economies

Exchange rate adjusted changes in amounts outstanding, in billions of US dollars



[1] A negative (positive) value indicates an increase (decrease) in BIS reporting banks' liabilities vis-à-vis emerging economies. [2] Changes in claims minus changes in liabilities. [3] Two-quarter moving average.

Graph 2.2

emerging Europe turned positive. However, the factors behind changes in banks' cross-border positions varied significantly across regions.

The turnaround in flows was most pronounced in Southeast Asia. In the fourth quarter of 2001, net flows from banks in the reporting area to Indonesia, Malaysia, the Philippines and Thailand as a group turned positive for the first time since the devaluation of the Thai baht in July 1997. Deposits by Southeast Asian residents remained more or less unchanged in the fourth quarter. The turnaround in net flows was instead driven by an increase in bank lending and securities purchases. In particular, cross-border claims on the Philippines rose by $2 billion, on Malaysia by $1.8 billion and on Thailand by $1.4 billion. Malaysian and Thai borrowers were also active in the international syndicated loan market in the first quarter of 2002, suggesting that the increase in cross-border claims continued into the new year (see "International syndicated credits in the first quarter of 2002" on page 22). Indonesia was the exception; cross-border bank claims on Indonesian residents contracted by a further $0.8 billion during the fourth quarter.

Claims on Southeast Asia increase for the first time since 1997

Interbank lending accounted for nearly all of the expansion in claims on Malaysia and Thailand, and 70% of the increase vis-à-vis the Philippines. Approximately half of the inflows to the Philippines were denominated in yen, as were two thirds of the inflows to Thailand. The remainder was denominated principally in US dollars. Banks' purchases of samurai bonds issued by the Philippine and Thai governments during the fourth quarter of 2001 appear to explain part of the rise in yen claims. In addition, the attractiveness of dollar-denominated borrowings relative to local currency debt was increased by the large decline in US interest rates and the stability of local exchange rates against the dollar in the latter part of 2001.

Asians and oil exporters withdraw deposits

In northern Asia, inflows from banks in the reporting area exceeded outflows for the second consecutive quarter. In contrast to Southeast Asia,

withdrawals of deposits from banks abroad rather than increases in claims lay behind this shift. Residents of mainland China and Taiwan, China (hereinafter Taiwan) had deposited large sums with banks in the reporting area between mid-1999 and mid-2001 (see "Following Chinese banks' foreign currency liquidity" on page 18). In the latter half of 2001, the decline in short-term dollar interest rates led them to withdraw some of these deposits. However, according to data from the US Treasury, residents of mainland China continued to purchase longer-term dollar bonds.

Cross-border positions of BIS reporting banks vis-à-vis emerging economies

Exchange rate adjusted changes in amounts outstanding, in billions of US dollars

	Banks' position[1]	2000	2001	2000	2001				Stocks at end-Dec 2001
		Year	Year	Q4	Q1	Q2	Q3	Q4	
Total[2]	Claims	–11.7	–19.4	–5.8	2.7	–8.6	–11.2	–2.2	865.8
	Liabilities	141.9	24.0	28.2	38.7	26.9	–14.2	–27.4	1,086.2
Argentina	Claims	1.2	–5.9	0.2	–1.7	1.6	–2.1	–3.7	40.8
	Liabilities	3.2	–16.5	–1.0	–6.0	2.3	–1.7	–11.1	23.9
Brazil	Claims	9.5	0.7	4.6	4.0	0.1	–0.9	–2.5	94.9
	Liabilities	–4.6	0.4	0.7	–2.6	2.2	4.9	–4.2	47.4
Chile	Claims	0.3	0.4	–0.5	0.5	0.4	–0.5	0.1	19.0
	Liabilities	–1.5	–1.2	0.4	–0.3	0.2	–0.6	–0.6	14.4
China	Claims	–5.4	–3.6	–0.4	–1.8	1.5	–2.7	–0.6	54.1
	Liabilities	35.8	–6.4	8.1	0.6	3.5	–6.6	–3.9	93.9
Indonesia	Claims	–3.6	–5.4	–0.4	–0.8	–1.5	–2.3	–0.8	35.1
	Liabilities	–1.0	1.1	–0.4	1.5	–0.7	–0.4	0.7	14.0
Korea	Claims	–4.7	–0.2	–9.3	3.3	–2.6	1.0	–2.0	62.3
	Liabilities	–1.7	1.7	–6.9	4.6	–2.2	–2.4	1.7	28.7
Mexico	Claims	–1.0	4.6	–3.8	4.9	–0.2	–1.5	1.4	62.6
	Liabilities	7.1	9.4	–1.6	3.2	0.6	4.7	0.9	63.3
Russia	Claims	–6.6	1.3	–0.6	–1.2	0.3	0.1	2.1	36.4
	Liabilities	7.2	5.2	–1.8	3.8	2.6	–2.8	1.7	28.4
Saudi Arabia	Claims	0.1	–2.4	1.4	–1.9	0.1	–1.6	1.0	23.5
	Liabilities	10.9	–9.7	4.9	4.7	–1.4	–5.8	–7.3	51.3
South Africa	Claims	0.6	–0.4	0.6	0.5	–0.5	0.8	–1.1	17.8
	Liabilities	0.4	2.2	–1.0	1.2	0.6	1.1	–0.9	16.1
Thailand	Claims	–7.7	–3.5	–3.3	–1.0	–0.8	–3.1	1.4	23.1
	Liabilities	1.9	1.3	1.8	0.3	1.0	–0.5	0.5	15.5
Turkey	Claims	11.3	–12.0	3.4	–2.2	–5.1	–0.9	–3.7	36.4
	Liabilities	2.3	–2.1	2.6	–1.2	0.4	0.8	–2.1	18.3
Memo:									
EU accession countries[3]	*Claims*	*5.2*	*6.7*	*2.9*	*3.4*	*–0.5*	*1.8*	*1.9*	*70.4*
	Liabilities	*5.5*	*9.9*	*3.0*	*4.5*	*–0.2*	*0.9*	*4.8*	*63.2*
OPEC members	*Claims*	*–11.8*	*–14.1*	*–1.5*	*–7.2*	*–2.8*	*–4.7*	*0.6*	*125.4*
	Liabilities	*37.8*	*–2.6*	*7.6*	*13.3*	*2.1*	*–9.4*	*–8.6*	*243.4*

[1] Liabilities comprise mainly deposits. Other liabilities account for less than 1% of the total outstanding. [2] All developing countries. [3] Countries in accession negotiations with the European Union, ie Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, the Slovak Republic and Slovenia. Table 2.2

Following Chinese banks' foreign currency liquidity

Guonan Ma and Robert N McCauley

The growth of China's official foreign exchange reserves – a $67 billion increase in the last three years – is well known. The even larger build-up of foreign currency liquidity in banks in China is less well known (Table A). To improve returns on such surplus dollars while strengthening Hong Kong SAR's role as a financial centre, Governor Dai of The People's Bank of China proposed in February to funnel this banking system liquidity into Hong Kong's financial markets. This box measures the recent growth of foreign currency liquidity in China, both official foreign exchange reserves and funds in the banking system, and traces its flow into the international banking system and overseas securities markets.

Foreign currency deposits of non-banks resident in China have grown very rapidly in recent years. These deposits have accumulated principally at Chinese banks on the mainland, but also in banks offshore (including in Chinese banks' affiliates in Hong Kong and elsewhere) and at foreign banks in mainland China, which until recently could only serve foreign firms and individuals. Increased individual dollar deposits represent most of the recent growth. Our focus here is on the use of onshore foreign currency deposits; in the next *BIS Quarterly Review*, we will explore the interest rate differentials and other factors behind their rapid growth.[①] The growth of foreign currency *lending* in China has not kept pace with the deposit growth – quite the contrary, as borrowers have been paying such loans down. The resulting surplus foreign currency liquidity in onshore banks has rivalled the growth of China's official reserves. Over the last three years, the rise in foreign currency deposits in banks on the mainland, combined with the decline in foreign currency loans, amounted to $75 billion, a sum larger than the increase in China's official foreign exchange reserves (Table B).

Where does the surplus dollar liquidity of the banks on the mainland go? Publicly available data do not permit this question to be answered for China's banking system alone, but it can be answered for the official and banking sectors in aggregate. Taken together, Chinese data suggest

A. Foreign currency bank deposits of non-banks in mainland China

End of period, in billions of US dollars

	1992	1995	1998	2000	2001
Total	60.7	69.7	97.3	145.6	154.5
In mainland China (onshore)	57.9	66.7	93.0	134.8	142.6
Locally owned banks	56.1	63.6[1]	88.5[1]	128.3	134.9
Individuals	9.4	15.9[1]	41.3[1]	73.0	81.6
Firms	26.7	29.3[1]	38.5[1]	46.0	45.3
Others	20.1	18.4[1]	8.8[1]	9.3	8.0
Foreign banks[2]	1.8	3.1	4.6	6.5	7.8
Offshore[3]	2.8	2.9	4.3	10.9	11.9
Memo:					
In locally owned banks as a percentage of total renminbi deposits	*12.3*	*8.7*	*8.3*	*8.6*	*7.8*
Foreign exchange reserves	*19.4*	*73.6*	*145.0*	*165.6*	*212.2*

[1] Dollar deposits estimated using individual bank data from *Almanac of China's banking and finance*. [2] Onshore foreign currency deposits at foreign banks operating in mainland China are estimated as their total deposits, assuming that they are all foreign currency denominated. [3] Non-bank Chinese deposits at BIS reporting banks.

Sources: The People's Bank of China; *Almanac of China's banking and finance*; BIS; authors' estimates.

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① See Robert N McCauley and Yip K Mo, "Foreign currency deposits of firms and individuals with banks in China", *BIS Quarterly Review*, August 2000, and Ben S C Fung and Robert N McCauley, "Analysing the growth of Taiwanese deposits in foreign currency", *BIS Quarterly Review*, September 2001.

B. China's foreign currency liquidity flows

Changes, in billions of US dollars

	1999	2000	2001	1999–2001
Sources[1]	38.0	45.7	58.8	142.4
Foreign exchange reserves	9.7	10.9	46.6	67.2
Deposits in onshore banks[2]	15.4	26.4	7.9	49.6
Less loans of onshore banks[2]	12.9	8.4	4.3	25.6
Uses[1]	24.9	55.2	45.2	125.1
Net claims on BIS reporting banks	9.7	34.1	–4.2	39.6
Of which: on banks in Hong Kong	*3.8*	*14.4*	*–4.2*	*14.1*
Net purchases of US debt securities	15.1	20.5	44.1	79.6
Treasury bonds and notes	8.2	–4.0	19.1	23.3
Agency bonds	8.3	18.8	26.0	53.1
Corporate bonds	0.5	0.8	6.7	8.0
Money market instruments	–2.0	4.8	–7.7	–4.9
Net purchases of German securities	1.5	1.7	1.3	4.4
Net purchases of Japanese securities	–1.4	–1.1	4.0[3]	1.5

[1] Sources do not include the corporate and non-deposit finance sectors; uses are also incomplete. [2] At both domestic and foreign banks. Onshore loans fell, thus adding to sources. [3] Estimates based on data for the first six months of 2001.

Sources: The People's Bank of China; Deutsche Bundesbank; Hong Kong Monetary Authority; Bank of Japan; US Treasury; BIS; authors' estimates.

that official reserve managers and banks in China needed to find uses for over $140 billion. A similar total of uses is evident in BIS banking data and major countries' portfolio flow data.

First, some $40 billion increased the net claims of Chinese banks and official monetary authorities on the international banking system (represented by the BIS reporting banks). Of this sum, $14 billion flowed through banks located in Hong Kong, mostly in the form of repayments on interbank advances denominated in foreign currencies.

Second, the bulk of China's surplus foreign currency liquidity flowed into US debt securities. The US Treasury reports that Chinese residents bought equal amounts of US Treasury and agency securities in 1999, but the balance tipped towards agencies in 2000 and 2001. Moreover, 2001 actually saw significant investment in corporate securities for the first time. This shift along the risk spectrum can be interpreted as showing a greater appetite for return and acceptance of risk, but was also consistent with changing relative supplies of different debts. On the whole, however, Chinese residents continued to choose high-quality and liquid US securities. While 90% of Chinese net purchases of US debt securities over the last three years flowed into Treasury and agency bonds, the rest of the world allocated only a third of such purchases to these safe bonds. This behaviour may reflect the institutions responsible for foreign investments in China compared to the rest of the world, where insurance companies and investment funds play a larger role.

Finally, Chinese funds also flowed into other markets. But flows into German and Japanese securities, for instance, represented only a fraction of recorded uses of dollar liquidity in the same period.

To conclude, the recent dollar surpluses of Chinese banks together with increases in official reserves have flowed into BIS reporting banks and major debt markets. Banks in Hong Kong have seen only about 10% of this flow. Thus, there is much scope for the Chinese authorities to increase the flow of dollar liquidity to Hong Kong if they wish to do so. One proposal would be to choose Hong Kong banks as the recipients of such flows. To the extent that banks serve as an entrepôt, in effect re-exporting the inflows to the rest of the global banking system, increasing this flow might not make much of an impact on Hong Kong's financial markets. An alternative approach would be to channel the surplus dollars currently in Chinese banks into investments in Hong Kong-listed shares (possibly those of China-related firms) through certain authorised funds. A policy of this kind could bring new investors to Hong Kong's stock market, adding liquidity, and alter the risk profile of China's offshore investments.

Similarly, a repatriation of funds deposited abroad boosted bank flows to oil-exporting countries during the fourth quarter. Saudi Arabia withdrew $7.3 billion from banks abroad, and Iran $3.2 billion. At the same time, a few oil-exporting countries stopped paying down their external bank debt. Claims on members of OPEC in fact increased modestly for the first time since late 1999, by $0.6 billion. The turnaround in bank flows to OPEC members, which began in the third quarter of 2001, mainly reflects the decline in the price of oil last year.

Claims on South Africa contracted by a relatively large $1.1 billion in the fourth quarter. However, this decline was entirely attributable to the large depreciation of the South African rand rather than an outflow of funds.[3] Banks abroad, especially banks in London, hold substantial amounts of rand-denominated corporate and government securities and also conduct sizeable cross-border interbank business in rand. As much as one quarter of the $18 billion outstanding stock of cross-border bank claims on South African borrowers is denominated in local currency. Among emerging economies, this proportion is higher in only two other countries: Estonia and Poland, where local currency claims make up approximately 30% of cross-border claims. In the vast majority of emerging economies, local currency claims account for a negligible share of cross-border claims.

Lending to Russia increases for the third consecutive quarter

In emerging Europe, banks continued to lend to and invest significant sums in countries in accession negotiations with the European Union, especially Poland. Russia too saw a large increase in claims, by $2.1 billion in the fourth quarter. This is the third consecutive quarterly increase in cross-border bank claims on Russia, and the largest yet. Most of the funds were channelled to non-banks, especially Russian oil and gas firms. Interbank claims also rose slightly, but interbank liabilities increased by even more as banks in Russia continued to channel foreign currency abroad: $1.7 billion in the fourth quarter of 2001.

The contraction of claims on Turkey, which had shown signs of moderating in the third quarter, resumed in the fourth. Interbank lending declined by $2.5 billion during the fourth quarter, similar to the size of the contraction in earlier periods. However, whereas claims on non-banks had increased in the third quarter, they decreased in the fourth. For the year as a whole, claims on Turkey fell by 24%, due almost entirely to cutbacks in credit to banks.

Banks in Argentina repatriate record amounts

International banking activity in Latin America was dominated by the crisis in Argentina. Banks in the reporting area cut back their claims on Argentina by $3.7 billion during the fourth quarter, or by 13% year over year. Unable to borrow foreign currency abroad and faced with rising withdrawals of dollars by local depositors, banks in Argentina repatriated $11.1 billion. Between end-2000 and end-2001, Argentine banks' external assets placed with banks in the

[3] The locational banking statistics are adjusted for movements in the major currencies, eg US dollar, euro, yen, pound sterling and Swiss franc. However, reporting countries do not provide a complete currency breakdown. Currencies other than major currencies are reported as a residual and so a precise currency adjustment is not possible. In most countries, the residual comprises cross-border positions denominated in the local currency of the counterparty.

reporting area fell by 75%, to $5.7 billion. Very little of this amount was rechannelled by non-banks back into the international banking system; liabilities to non-banks resident in Argentina increased by only 2% during 2001, to $18.2 billion.

Claims on Mexico rise ...

Despite the crisis in Argentina and several high-profile corporate defaults in Mexico in the latter part of 2001, Mexican borrowers continued to enjoy ready access to international debt markets. Between end-September and end-December, Mexican entities signed syndicated facilities amounting to $4 billion. Cross-border claims on Mexican non-banks increased by $1.1 billion during the same period, suggesting that up to one quarter of the amount raised in the syndicated loan market was net new financing.[4] In addition, interbank claims increased by $0.3 billion.

... while those on Brazil and Peru fall

Brazilian corporations too were active in the syndicated loan market, signing credits totalling $2.4 billion. However, unlike in Mexico, all of these funds appear to have been used to refinance maturing credits. In fact, claims on Brazilian non-banks contracted by $0.4 billion during the fourth quarter. Banks in Brazil borrowed substantial amounts of yen, but this was more than offset by a fall in dollar interbank claims. Overall, cross-border bank claims on Brazil contracted by $2.5 billion between end-September and end-December 2001.

Another Latin American country to see a large drop in bank claims was Peru. Cross-border claims fell by $0.4 billion in the fourth quarter, bringing the total decline in claims during 2001 to 11%. Notwithstanding this decline, foreign confidence in Peru's economic prospects showed signs of improvement in the early part of 2002. Indeed, Peru issued its first international bond in over 70 years in February 2002 (see "The international debt securities market" on page 23).

[4] Signings of syndicated credits approximate *gross* bank lending. In the locational banking statistics, claims capture both disbursements and repayments, and so reflect *net* lending.

International syndicated credits in the first quarter of 2002

Blaise Gadanecz

Activity in the international syndicated credits market continued to weaken in the first quarter of 2002. Signings fell by 13% on a seasonally adjusted basis, to $214 billion. With the exception of the second quarter of 2001, signings have fallen steadily on a seasonally adjusted basis since late 2000, when borrowing by telecoms peaked.

Despite the pickup in growth in the United States in the first quarter, the volume of new loans to US borrowers remained low, with $143 billion in new facilities signed. In Europe, signings totalled only $46 billion, a three-year low. Merger- and acquisition-related (M&A) deals totalled $25 billion, approximately one third as much as during their peak in 1999. Telecoms borrowing was boosted by a €15 billion facility for France Telecom, arranged to refinance a larger facility signed in mid-2000 to support the company's bid for Orange and third-generation mobile phone licences. The spread on the new facility was almost twice as high as that on the original facility, reflecting the repricing of telecoms risk in capital markets over the last few quarters.

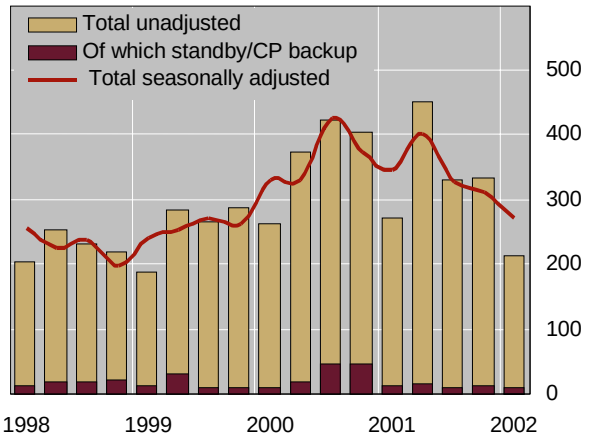
The proportion of credits with an original maturity of one year or less fell to 43% of total signings in the first quarter, from an average of 49% during 2001. One factor behind this decline was the shift among borrowers towards longer-term debt, a trend evident in debt securities markets since at least early 2001. In addition, several high-profile drawdowns during the first quarter of 2002, such as those by Tyco in February and ABB in March, made some banks more reluctant to provide short-term standby facilities. Signings of facilities intended to backstop commercial paper programmes fell by 30% in the first quarter, to $9 billion from a quarterly average of $13 billion during 2001.

Syndicated lending to emerging economies remained more or less unchanged on a seasonally adjusted basis. Although facilities totalling only $11 billion were signed, activity in the first quarter is usually weak. Asian borrowers were the most active. Taiwanese corporations, mainly high-tech firms, raised $1.4 billion, and Malaysian borrowers $1.2 billion, half of which was for the government. Thai firms signed facilities totalling $0.6 billion, the largest amount since the end of 2000. South African firms raised $1.6 billion, more than one third of which was a refinancing facility for AngloGold. Borrowing by Latin American entities fell to a five-year low of $1.6 billion. There was no new syndicated lending to Argentine or Turkish borrowers in the first quarter.

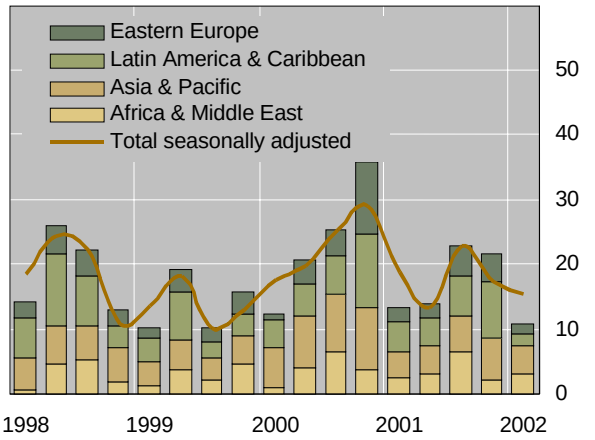
Activity in the international syndicated credit market

In billions of US dollars

Signed facilities



Facilities for emerging economies



Sources: Dealogic Loanware; BIS.

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3. The international debt securities market

The rebound in US economic activity during the first quarter of 2002 was not associated with a global increase in the demand for international financing. Net issuance in the international debt securities market during the first quarter was $210 billion (Table 3.1), 23% below the level attained in the previous quarter

Main features of net issuance in international debt securities markets

In billions of US dollars

	2000	2001	2001				2002	Stocks at end-Mar 2002
	Year	Year	Q1	Q2	Q3	Q4	Q1	
Total net issues	1,241.1	1,067.0	326.3	291.6	177.3	271.8	209.6	7,412.5
Money market instruments[1]	152.1	–78.9	2.2	–26.2	–45.6	–9.3	–8.4	387.2
Commercial paper	*55.2*	*26.9*	*22.3*	*10.1*	*–12.0*	*6.5*	*5.5*	*247.3*
Bonds and notes[1]	1,088.9	1,145.9	324.1	317.8	222.9	281.1	218.0	7,025.3
Floating rate issues	*356.8*	*301.7*	*85.5*	*70.2*	*73.9*	*72.1*	*45.3*	*1,772.3*
Straight fixed rate issues	*715.4*	*808.6*	*234.7*	*238.0*	*142.9*	*193.1*	*169.6*	*4,980.3*
Equity-related issues	*16.7*	*35.5*	*3.9*	*9.6*	*6.1*	*15.9*	*3.1*	*272.7*
Advanced economies	1,160.9	990.2	312.1	252.2	163.9	262.0	191.4	6,438.5
United States	*465.3*	*481.1*	*151.9*	*121.2*	*93.7*	*114.2*	*105.3*	*2,323.1*
Euro area	*559.4*	*424.6*	*146.8*	*95.4*	*66.2*	*116.2*	*72.6*	*2,616.6*
Japan	*–25.9*	*–14.0*	*–4.1*	*0.3*	*–6.5*	*–3.7*	*–9.7*	*246.7*
Offshore centres	15.0	21.0	7.1	5.4	4.6	3.9	2.6	92.6
Emerging economies	42.4	39.8	8.9	28.4	–2.2	4.6	8.1	493.4
International institutions	22.8	16.1	–1.8	5.7	11.0	1.2	7.5	388.1
Private sector	973.0	803.2	264.8	215.3	122.0	201.2	134.1	5,514.4
Financial institutions[2]	*800.4*	*641.7*	*221.5*	*159.4*	*101.7*	*159.1*	*132.8*	*4,457.2*
Corporate issuers	*172.6*	*161.6*	*43.3*	*55.9*	*20.3*	*42.1*	*1.2*	*1,057.3*
Public sector[3]	245.3	247.7	63.3	70.7	44.4	69.3	68.1	1,510.0
Central government	*52.6*	*38.3*	*9.4*	*23.3*	*–2.3*	*8.0*	*16.4*	*529.7*
State agencies and other	*192.7*	*209.5*	*54.0*	*47.5*	*46.7*	*61.4*	*51.6*	*980.3*
Memo: Domestic CP[4]	*255.0*	*–140.1*	*–57.1*	*–63.3*	*–50.9*	*31.2*	*–78.3*	*1,827.7*
of which: US	*208.3*	*–161.2*	*–63.1*	*–67.9*	*–58.5*	*28.3*	*–63.3*	*1,377.6*

[1] Excluding notes issued by non-residents in the domestic market. [2] Commercial banks and other financial institutions. [3] Excluding international institutions. [4] Data for the first quarter of 2002 are partly estimated.

Sources: Bank of England; Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; national authorities; BIS.

Table 3.1

Gross issuance in the international bond and note markets

In billions of US dollars

	2000	2001	2001				2002
	Year	Year	Q1	Q2	Q3	Q4	Q1
Total announced issues	1,707.7	2,027.9	554.5	562.0	419.9	491.5	523.7
Floating rate issues	521.0	556.5	134.5	135.4	139.0	147.5	129.2
Straight fixed rate issues	1,130.2	1,403.9	407.5	408.9	269.7	317.7	385.1
Equity-related issues[1]	56.5	67.5	12.4	17.7	11.1	26.2	9.4
US dollar	794.5	982.0	259.9	286.6	224.0	211.5	270.1
Euro	582.7	719.6	215.2	187.5	123.8	193.2	182.5
Yen	129.1	120.6	27.7	36.8	32.0	24.2	16.0
Other currencies	201.4	205.7	51.8	51.2	40.1	62.6	55.1
Private sector	1,322.6	1,479.5	411.7	398.7	294.1	375.0	372.8
Financial institutions[2]	*1,090.4*	*1,178.8*	*332.8*	*309.1*	*244.5*	*292.3*	*317.1*
Corporate issuers	*232.2*	*300.7*	*78.8*	*89.6*	*49.5*	*82.7*	*55.8*
of which: telecoms	*115.3*	*134.6*	*49.5*	*30.2*	*15.9*	*39.0*	*11.6*
Public sector	316.0	473.7	125.9	140.4	105.8	101.7	122.8
Central government	*92.9*	*108.5*	*31.4*	*49.4*	*13.4*	*14.2*	*30.8*
State agencies and other	*223.1*	*365.2*	*94.5*	*90.9*	*92.3*	*87.4*	*91.9*
International institutions	69.2	74.6	17.0	22.9	20.0	14.8	28.1
Completed issues	1,709.5	2,025.6	543.0	551.0	430.6	501.1	487.2
Memo: Repayments	*620.5*	*879.7*	*218.9*	*233.2*	*207.7*	*219.9*	*269.3*

[1] Convertible bonds and bonds with equity warrants. [2] Commercial banks and other financial institutions.

Sources: Bank of England; Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS. Table 3.2

and 36% below that of the first quarter of 2001. With gross announced issuance a relatively strong $524 billion (Table 3.2), net issuance was kept low because of a surge in repayments to $270 billion, a record amount.

The decline in net issuance since the fourth quarter of 2001 probably overstates the change in demand for international financing. BIS estimates suggest that the attacks on 11 September led to the postponement of about $50 billion of issuance from the third quarter to the fourth. On the assumption that repayments were not similarly affected by the attacks, net issuance during the fourth quarter was artificially strong. Adjusting for this factor, net issuance in the international debt securities market was relatively stable over the last two quarters as the reduced funding needs of telecoms operators and auto manufacturers were partly offset by increased net issuance by central governments and emerging economies.

The first quarter of 2002 witnessed shifts in the maturity structure of international debt obligations, as an unreceptive commercial paper market led some borrowers to lengthen the maturity of their debt. Indeed, the stock of outstanding domestic commercial paper in the United States fell by $63 billion during the first quarter, while the outstanding stock of international money market instruments declined for the fourth quarter in a row.

Issuance by private sector borrowers in advanced economies remains depressed

The decline in net issuance of international debt securities between the fourth quarter of 2001 and the first quarter of this year can be attributed entirely to the behaviour of borrowers in the advanced economies. Net issuance by borrowers based in the euro area declined the most in absolute terms, from $116 billion to $73 billion, while net issuance by borrowers based in the United States fell from $114 billion to $105 billion. Net issuance by Japanese borrowers was negative for the third quarter in a row. The decline, at $10 billion, was almost entirely due to Japanese financial institutions.

A sharp fall in private sector borrowing ...

A sharp drop in private sector borrowing was the main cause of declining net issuance by the advanced economies. Globally, net issuance by financial institutions fell to $133 billion, 40% below the recent peak value attained during the first quarter of 2001. Net issuance by non-financial corporations essentially dried up, falling by 97% to $1 billion, indicating that in the aggregate a substantial part of gross issuance was used for refinancing.

The reduced funding needs of telecoms operators and auto manufacturers also played a role. Gross long-term issuance by telecoms declined from $39 billion in the fourth quarter of 2001 to $12 billion in the first quarter of 2002, while gross long-term issuance by auto manufacturers fell from $27 billion to $20 billion. In contrast, public sector net issuance, at $68 billion, remained strong as a surge in borrowing by central governments to $16 billion approximately offset a 16% decline in net issuance by state agencies.

The relative strength of issuance during the fourth quarter of 2001 should be viewed in the context of the previous impact of the global economic slowdown on the demand for international financing. Net issuance in the international debt securities market during the first quarter of 2002 was well below the levels which prevailed before the onset of the global slowdown. The fact that net issuance has not returned to more normal rates suggests that businesses around the world remain hesitant to undertake significant new fixed investment.

... suggests investment demand remains weak

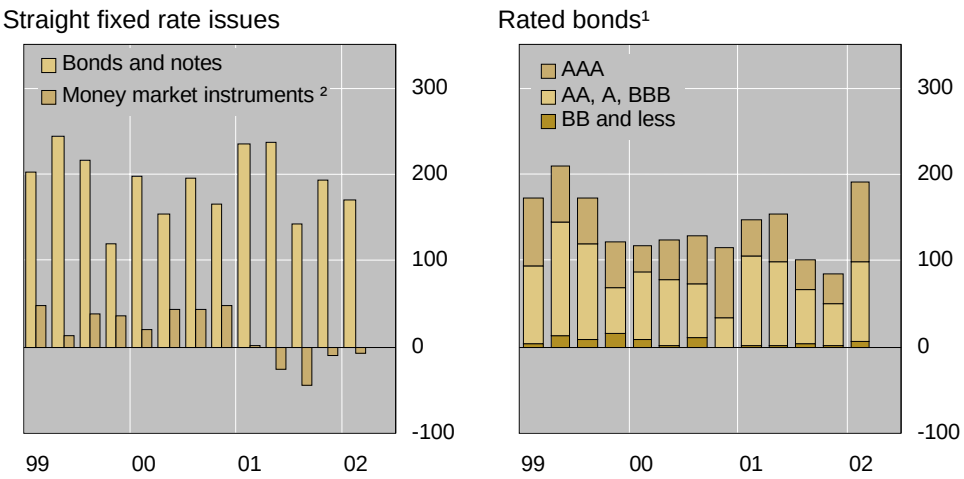
Continuing difficulties in the commercial paper market encourage longer-term issuance

Continuing difficulties in the CP market ...

Rating downgrades and the unwillingness of some banks to provide backup lending facilities (see (see discussion on pages 5–7) led to further difficulties for some traditionally large issuers in the commercial paper (CP) market during the first quarter of 2002. Money market mutual funds are the main purchasers of CP, and the amount of lower-rated CP that they can hold has long been limited by Securities and Exchange Commission regulations. The rating agencies downgraded several major issuers early in the year, effectively closing off the CP market to them. Moreover, in April a major money centre bank announced that it was pulling out of providing the backup facilities that have recently become requirements for CP programmes. In the US domestic

Net issuance by maturity and credit rating

International issuance, in billions of US dollars



¹ Includes bonds issued under EMTN documentation. ² Excludes issues redeemed in the same quarter.

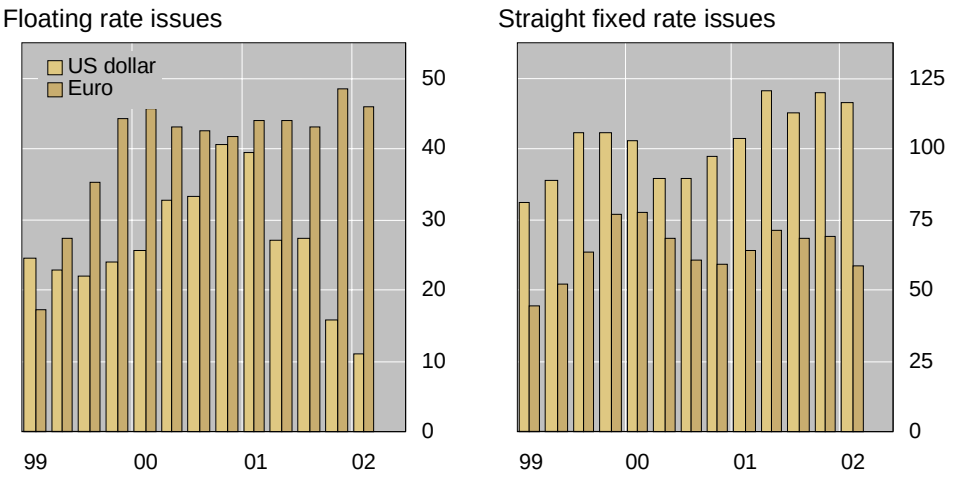
Sources: Bank of England; Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.

Graph 3.1

market, these difficulties again led to a fall in the stock of outstanding CP which, at $1,378 billion, is 14% below the peak reached during the fourth quarter of 2000. There has been an even sharper contraction in the stock of outstanding domestic CP of non-financial corporations, which has fallen by 50% since the third quarter of 2000. The stock of international money market instruments also declined during the first quarter of 2002 for the fourth quarter in a row.

Net issuance of international bonds and notes

Four-quarter moving averages, in billions of US dollars



Sources: Bank of England; Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.

Graph 3.2

... again encourage longer-term issuance

Net issuance of rated bonds rose sharply during the first quarter, increasing by 128% to a near record high of $191 billion (Graph 3.1). Net issuance of AAA-rated bonds grew significantly between the fourth quarter of 2001 and the first quarter of this year, rising by 172% to $93 billion, while net issuance of BBB-rated bonds expanded from $4.8 billion to $7.7 billion. The increased issuance in the BBB rating category is consistent with the view, expressed in the overview section, that difficulties in the CP market during the fourth quarter were associated with a continuing shift by corporate borrowers from short-term to long-term debt. Issuers in US dollars again displayed a preference for straight fixed rate paper (Graph 3.2) while issuers in the euro market maintained their preference for floating rates.

Net issuance by emerging economies recovers

Greater aggregate issuance by emerging economies ...

Net issuance in the international debt securities market by emerging economies recovered somewhat further during the first quarter of 2002, reaching $8 billion, just short of the $10 billion average quarterly net issuance since the onset of the Asian financial crisis. The rise in net issuance was fairly evenly spread across all regions. Gross announced issuance by emerging market borrowers increased from $22 billion in the fourth quarter of 2001 to $26 billion during the first quarter of 2002.

Net issuance of international debt securities by currency and region[1]

In billions of US dollars

Region/currency		2000	2001	2001				2002
		Year	Year	Q1	Q2	Q3	Q4	Q1
North America	US dollar	378.5	400.4	121.9	97.7	83.9	96.9	89.7
	Euro	44.5	64.4	20.9	15.5	7.2	20.9	18.0
	Yen	17.2	16.4	3.2	5.2	6.4	1.6	–3.5
	Other currencies	17.3	7.4	4.9	3.2	–1.5	0.7	3.7
Europe	US dollar	171.9	46.5	23.8	13.2	–2.7	12.2	3.2
	Euro	411.6	396.7	128.7	98.7	57.9	111.4	82.8
	Yen	40.8	–2.6	–6.0	2.1	3.9	–2.6	–13.3
	Other currencies	88.0	69.8	19.2	11.3	11.9	27.5	17.4
Others	US dollar	61.5	55.0	7.4	36.2	9.7	1.7	17.6
	Euro	15.0	12.9	5.3	4.5	0.3	2.9	3.5
	Yen	–20.3	–1.9	–3.2	4.5	–2.1	–1.0	–12.5
	Other currencies	15.0	1.9	0.2	–0.4	2.4	–0.3	3.1
Total	US dollar	611.9	501.9	153.1	147.1	90.9	110.8	110.6
	Euro	471.1	474.1	154.9	118.6	65.4	135.1	104.3
	Yen	37.7	12.0	–6.0	11.8	8.3	–2.0	–29.3
	Other currencies	120.4	79.1	24.4	14.1	12.7	27.9	24.1

[1] Based on the nationality of the borrower.

Sources: Bank of England; Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS. Table 3.3

... hides intraregional differences

The aggregate issuance figures hide important intraregional differences in borrowing patterns. In emerging Asia, for example, a sharp fall in net issuance by South Korean borrowers, from $1.5 billion to –$2.4 billion, between the fourth quarter of 2001 and the first quarter of this year was partially offset by a rise in net issuance by borrowers based in China and the Philippines. Chinese borrowers increased their net issuance from –$0.3 billion to $0.5 billion and borrowers in the Philippines from $0.8 billion to $1.7 billion. The latter figure includes two sizeable US dollar issues by the Republic of the Philippines, of $1 billion and $0.75 billion. In emerging Latin America, Brazil's net issuance increased by $3.2 billion between the fourth quarter of 2001 and the first quarter of 2002 and that of Mexico by $1.6 billion. Peru, which issued its first international bond since 1928, raised $0.5 billion in new money and another $0.9 billion in exchanging five outstanding Brady bonds. In contrast, net issuance by Argentine entities fell by $2 billion and that of Venezuelan entities by $1.0 billion.

Peru issues first international bond in over 70 years

Net issuance of equity-related securities at all-time low

Net issuance of equity-related securities fell to $3 billion in the first quarter of 2002 from $16 billion in the previous quarter. As a percentage of total announced issuance (Table 3.2), gross equity-related issuance reached an all-time low during the first quarter of 2002. Hedge funds were large holders of convertible bonds, and they suffered heavy losses on their positions in these instruments during the fourth quarter of 2001. As a consequence, these funds had a sharply reduced appetite for equity-related securities.

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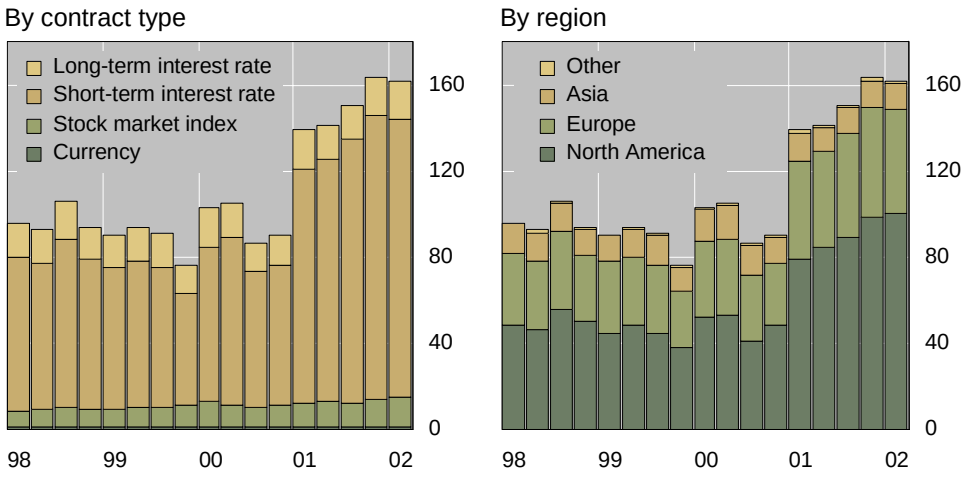
4. Derivatives markets

Following a record volume of activity in the fourth quarter of 2001, the aggregate turnover of exchange-traded derivatives contracts monitored by the BIS declined slightly in the first quarter of 2002. Conditions in fixed income markets were somewhat calmer than in the last quarter of 2001, which probably accounts for the 1% decline in transactions to $162 trillion. A modest increase in the turnover of futures contracts on short- and long-term interest rates was more than offset by a marked drop in related options.

The latest BIS semiannual data on aggregate positions in the global over-the-counter (OTC) derivatives market point to a further recovery of activity in the second half of 2001. The total estimated notional amount of outstanding OTC contracts stood at $111 trillion at end-December 2001, an 11% increase over end-June 2001. Growth was largely driven by interest rate instruments, as vigorous US monetary easing fuelled hedging and position-taking. Even so, the acceleration of activity observed in OTC markets over the whole of 2001 was less pronounced than that seen in exchange-traded markets over the same period.

Turnover of exchange-traded futures and options

Quarterly data, in trillions of US dollars



Sources: FOW TRADEdata; Futures Industry Association; BIS calculations. Graph 4.1

Slowdown in exchange-traded fixed income derivatives

Activity in exchange-traded interest rate contracts moderated in the first quarter of 2002. Total turnover contracted by 2% to $147.3 trillion compared with an increase of 8% in the last quarter of 2001. Much of the decline resulted from weaker activity in contracts on short-term interest rates, with transactions falling by 2% to $129.7 trillion. A 9% contraction in options on short-term rates (to $33 trillion) more than offset a 1% increase in related futures (to $96.7 trillion). The narrow range within which US short-term interest rates evolved probably exerted a dampening impact on mortgage refinancing, which often leads to a second round of transactions in short-term options and swaptions.[1]

Drop in options on short-term rates offsets increase in related futures

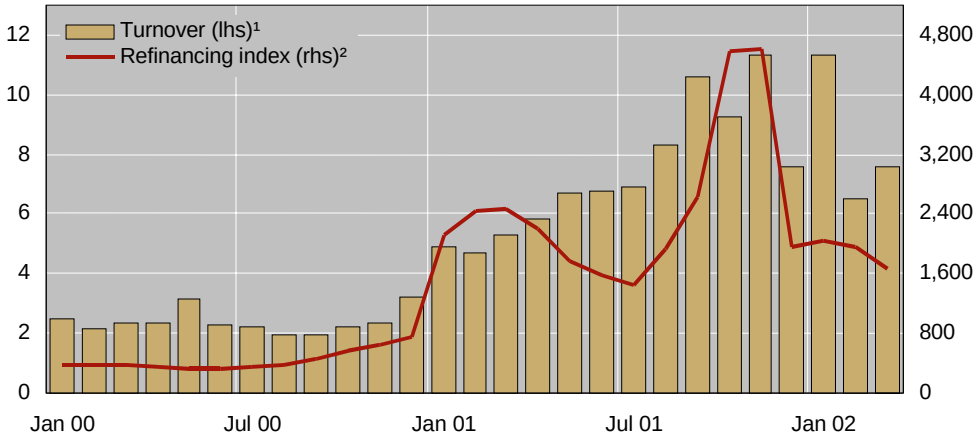
There was also a slight decrease in the aggregate turnover of contracts on government bonds, by 1% to $17.6 trillion. As was the case with contracts on short-term rates, activity in government bond futures and options followed divergent paths, with a 23% decline in options (to $1.9 trillion) offsetting a 3% increase in futures (to $15.6 trillion). The drop in options trading was largely concentrated in options on German government bonds (from $1.1 trillion to $0.6 trillion). Surprisingly strong macroeconomic data in late February and early March, combined with concerns about a potential resurgence of inflation, created some upward pressure on US and European bond yields but otherwise government bond markets tended to trade in a fairly narrow range.

A similar pattern is observed in bond contracts

The 3% overall increase in government bond futures trading was localised in the United States (+5%) and Japan (+12%). In the United States, five- and 10-year Treasury note futures continued to gain market share at the expense of Treasury bond contracts. At the same time, Japanese government bonds

US Treasury note contracts gain market share ...

Options turnover on US short-term interest rates and US mortgage refinancing index



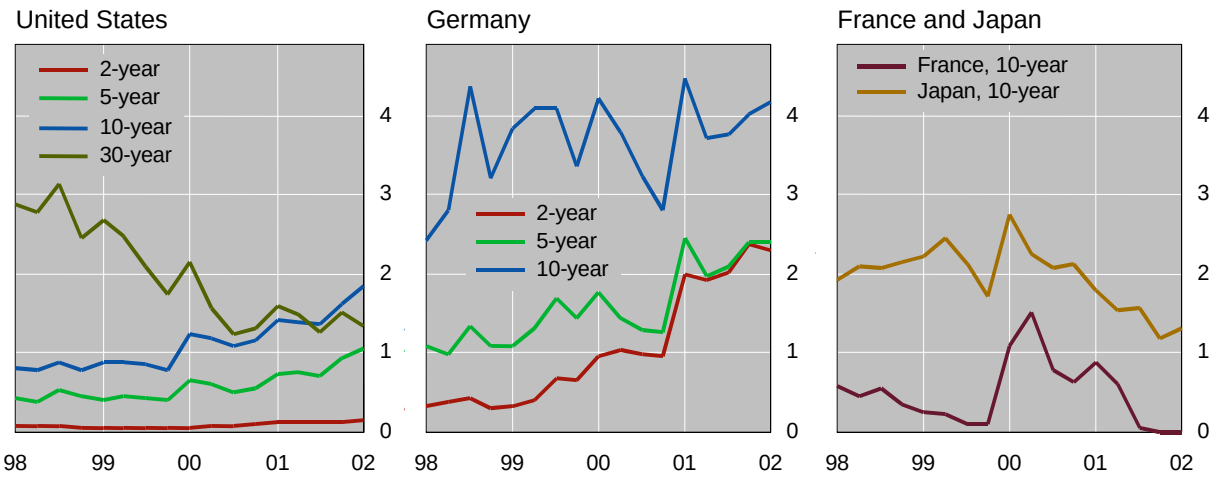
[1] In trillions of US dollars. [2] Four-week moving average, 16 March 1990 = 100.

Sources: Financial Oxygen; FOW TRADEdata; Futures Industry Association; Mortgage Bankers Association; BIS calculations. Graph 4.2

[1] The mechanics of which have been discussed in recent issues of the *BIS Quarterly Review*.

Turnover in government bond contracts

Quarterly futures contract turnover, in trillions of US dollars



Sources: FOW TRADEdata; Futures Industry Association; BIS calculations. Graph 4.3

... while trading in JGB futures recovers

exhibited significant volatility as investors reacted to poor economic data releases and disagreed about the consequences of the lack of progress in resolving the country's banking crisis. Moreover, investors were concerned that Japanese government debt would increase further, with possible negative implications for the country's credit rating. These various factors probably accounted for the recovery in trading.

Trading in stock index contracts boosted by expansion in Asia

Sustained development of Korean index contracts

Overall activity in equity index contracts expanded by 5% to $13.8 trillion in the first quarter of 2002. Much of this increase resulted from the sustained development of stock index trading in Korea. Trading in such instruments, particularly options, rose by 20% in the first quarter, to $2.9 trillion. As a result, the Korean marketplace is now the second most active after that of the United States ($7 trillion). Trading in Korean contracts has been fuelled by strong inflows of foreign capital to the Korean stock market, which have boosted the KOSPI index to record highs.

Upswing in Japanese index business

The first quarter of 2002 also saw an upswing in the trading of Japanese index contracts, with turnover rebounding in March from a near record low in January. While the upsurge in index trading may have been related to the recovery of underlying equity markets, it may also have been the result of a displacement of activity to futures exchanges following the introduction in Japan of new rules on the short selling of shares.[2]

[2] In early March, the Japanese regulatory authorities introduced new "uptick" rules, which prohibit the short selling of listed equities without a prior increase in stock prices.

Playing cat and mouse in market squeezes

Serge Jeanneau and Robert Scott

Regulatory authorities and participants in financial markets often play a cat and mouse game, whereby the introduction of new rules leads agents to alter their behaviour in an attempt to circumvent the new rules. This seems to have happened in March 2002, when some market participants were reported to have attempted to corner, or squeeze in market parlance, a segment of the German government bond market.

The instruments involved were the two-year German government notes, otherwise known as "schatz" for Bundesschatzanweisungen. In its latest manifestation, the squeeze seems to have resulted from efforts by speculators to find a way around recent measures by Eurex, the German-Swiss derivatives exchange, to counter such practices. The measures included position limits on participants in the futures market. When it became difficult for speculators to corner specific futures contracts, they migrated to the cash market.

A squeeze occurs when holders of short positions cannot acquire or borrow the securities required for delivery under the terms of a futures contract. Delivery does not ordinarily pose a problem for traders because the majority of them close their positions with offsetting transactions prior to contract expiry. However, a trader who remains short at the expiration of a futures contract is obliged to deliver the specified securities, just as one who remains long must take delivery. Physical delivery is based on a specified range of eligible securities and a price adjustment to turn the different securities into equivalent assets. Depending on the level of market interest rates and the slope of the yield curve, one of the securities will always turn out to be the "cheapest-to-deliver" (CTD).[①]

Futures trading usually creates a wedge between the price of the CTD security and other similar securities that are not deliverable, with the CTD becoming more expensive. However, once the CTD moves out of the deliverable basket, it loses this "excess" demand and, as a result, its value tends to decline. This pattern is illustrated by the graph on the following page, which shows the evolution in the yields of a variety of CTD schatz notes before and after delivery of the relevant futures contracts on Eurex. Such issues, with the exception of the note deliverable into the March 2002 contract, have tended to range from as expensive as –10 basis points relative to "fair value" before maturity of the futures to as cheap as +10 basis points after expiry.[②]

Some investors try on occasion to take advantage of this predictable feature by selling the bond short when it is the CTD and then buying it back for a lower price once the futures contract has expired (or once it has fallen out of the deliverable basket). To do this, the investor must first borrow the security in the repo market, sell it, and then return it at an agreed date after it has been purchased in the market (hopefully at a lower price).

Market participants undertaking such short selling can at times face significant risks. Indeed, if one or more market participants were to accumulate most of the bonds available in the market, the short sellers would probably have to pay a high premium to buy back the bond. This appears to have happened to the 3.5% schatz note maturing in December 2003, which was the CTD bond of the March 2002 schatz contract.

Although the stock of outstanding 3.5% schatz securities maturing in December 2003 amounted to €10 billion, some market participants appear to have been able to take hold of a large portion of the supply, causing a squeeze in the cash market. Instead of becoming cheaper after expiry of the March 2002 schatz futures, the 3.5% schatz note increased substantially in value a full month after it had lost its eligibility for delivery. Indeed, its spread widened to –20 basis points one month after having rolled out of the deliverable basket, compared with a more normal +5 basis points for similar bonds. The above discussion shows that a statistical regularity does not guarantee "free money" to market participants following short selling strategies.

[①] The technical aspects of this phenomenon are explained in greater length in an earlier box published on page 32 of the June 2001 *BIS Quarterly Review*. [②] The fair value of a bond can be expressed as a yield spread relative to other bonds of similar maturity. One accepted market practice is to use a static spread (also called an option-adjusted spread). A negative spread means that a bond is more expensive than on average, and conversely, a positive spread indicates that a bond is cheaper.

A possibly more significant development is that the latest squeeze did not take place directly on the CTD before delivery, as had been the case in previous instances. This was illustrated by the fact that the CTD did not decline in value as the contract went through its normal delivery cycle.

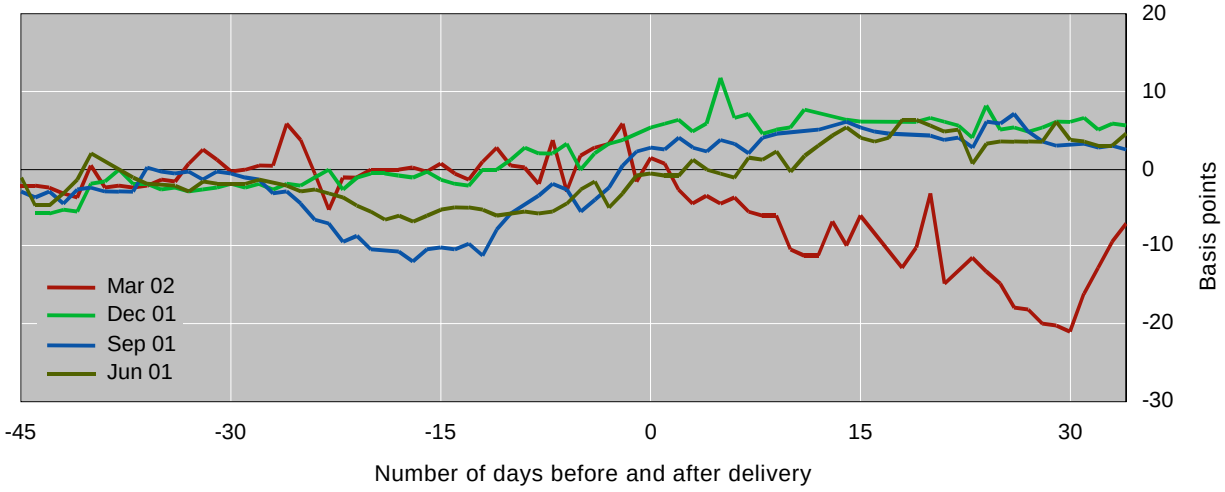
This change in the price behaviour of the schatz notes seems to be the result of a measure taken by Eurex in June 2001 to address the problems created by squeezes in the futures market. Following the debate surrounding a squeeze on the five-year German government bond contract ("bobl") in March 2001, Eurex introduced limits on the open positions of market participants. This measure seems to have been reasonably effective in deterring market manipulation in the futures market since the 3.5% schatz notes were delivered into the March 2002 futures contract without any particular difficulties.

To circumvent the restriction on open positions, market participants intent on creating a squeeze appear to have shifted their speculative transactions to the cash market. One market participant was reported to have acquired €7 billion of the 3.5% schatz notes. By comparison, the number of open positions on the March 2002 futures contract amounted to 500,000 contracts, equivalent to €50 billion or 17 times the amount of notes freely available for delivery. Of course, very few of these open positions would effectively have come to delivery since market participants prefer to avoid the complications associated with delivery by reversing their positions ahead of contract expiry.

The recent squeezes show that while German financial markets have been remarkably successful in recent years, they have also experienced growing pains. The use of futures and options on German government bonds has expanded rapidly as the underlying securities gained acceptance as benchmarks for hedging and position-taking on euro zone interest rates. As a result, the amount of exposures in futures and repos has become substantially larger than the available amount of underlying securities. This has created favourable conditions for squeezes.

Such manipulation is prohibited in a number of jurisdictions. In Germany, the forthcoming introduction of the Financial Market Promotion Act should provide regulators with greater power to fine investors who try to manipulate markets. The new legislation will complement the recent measures introduced by Eurex. In addition, the German federal government financing agency (Finanzagentur) has recently indicated that it stands ready to increase the volume of securities affected by squeezes.

Price pressures on CTD schatz notes before and after futures delivery



Note: The spread is calculated as a static spread of the deliverable bond relative to a fair-valued yield curve. A negative spread indicates that the bond is expensive relative to other similar bonds. Conversely, a positive spread indicates that it is cheaper than similar bonds.

Source: Bloomberg.

Rapid expansion of OTC derivatives in the second half of 2001

Data from the BIS survey on positions in the global OTC derivatives market at the end of December 2001 point to a sizeable increase in activity in the second half of last year. The total estimated notional amount of outstanding OTC contracts stood at $111 trillion at end-December 2001, an 11% increase over end-June 2001. This compares with a 5% increase in the previous half-year period. Gross market values grew by 24% to $3.8 trillion.

Growth driven by activity in interest rate products

Growth was driven by interest rate instruments, the largest of the broad market risk categories, with outstanding contracts rising by 15%. Activity was equally buoyant in all three main groups of interest rate products, namely forward rate agreements (FRAs), interest rate swaps and interest rate options. By contrast, the stock of foreign exchange contracts, the second largest broad market risk category, declined by 1%. Activity in equity-linked contracts was also subdued, with a similar percentage decline in amounts outstanding.

Buoyancy of dollar and euro interest rate swap markets

Most significant increase in interest rate swaps

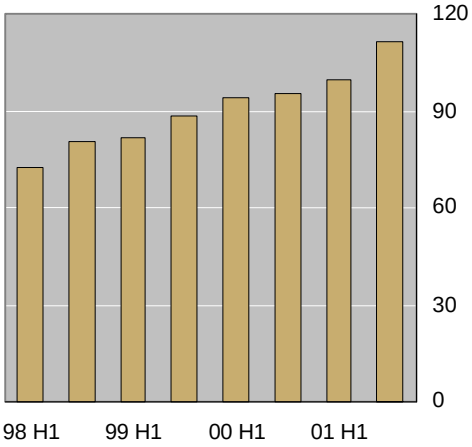
Business in interest rate products was brisk in the second half of 2001, with a 15% rise in outstanding contracts to $78 trillion. This buoyancy was evident in all market segments but the most significant increase in absolute terms took place in the interest rate swap market. With $59 trillion in outstanding contracts, interest rate swaps remain by far the largest single group of products in the OTC market.

US dollar swaps benefit from shift in trading practices ...

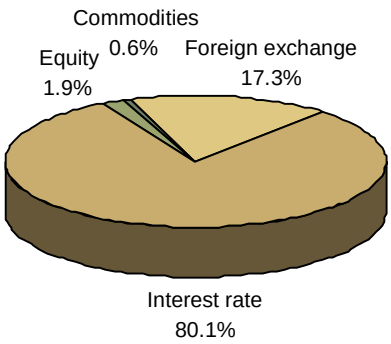
The US dollar and euro swap markets grew particularly rapidly. Dollar-denominated swaps expanded by 19% to $19 trillion. That market segment has grown at a steady and robust pace in recent years following a shift in hedging and trading practices.[3] The rapid increase in dollar-denominated swap

Global OTC derivatives

Total notional amounts outstanding in trillions of US dollars



Breakdown by broad risk category at end-2001

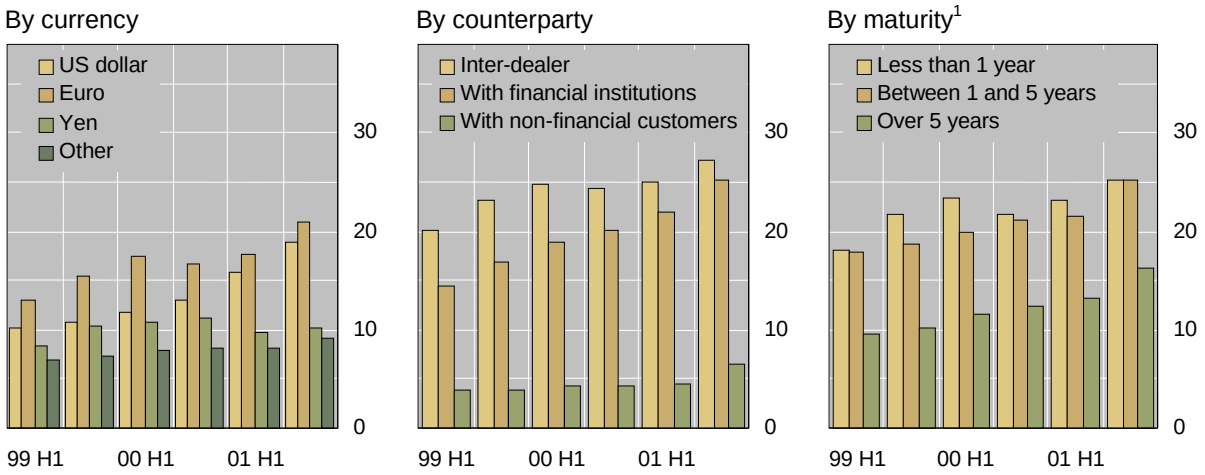


Source: BIS. Graph 4.4

[3] The factors underlying this long-term shift have been discussed in recent issues of the *BIS Quarterly Review*.

Interest rate swaps

Notional amounts outstanding, in trillions of US dollars



[1] Includes forward rate agreements, which account for approximately 15% of the total notional amount outstanding.

Source: BIS. Graph 4.5

contracts in the latter half of last year suggests that US derivatives trading has been sufficiently buoyant to offset the possible contractionary impact of market consolidation.[4] Vigorous monetary easing by the United States, in the wake of a pronounced deceleration of US economic growth and the terrorist attacks of 11 September 2001, probably fuelled hedging and position-taking activity in dollar-denominated derivatives.

... monetary easing ...

Moreover, the range of participants active in dollar derivatives markets appears to have broadened in recent periods to include, for example, mortgage banks and investors in mortgage-backed securities (MBSs). As long-term interest rates declined sharply between June and early November, such market participants were reported to have turned in increasing numbers to the swap and swaption markets in order to hedge the prepayment risk of their holdings of MBSs (Graph 4.2).[5]

... and a widening range of market participants

[4] Some market participants had expected the merger of JP Morgan and Chase, announced at the end of 2000, to have a contractionary effect on the total stock of US dollar positions in 2001. These two financial institutions began to report their derivatives positions to the BIS (through the Federal Reserve) on a consolidated basis in the first half of 2001 but this did not result in a decline of aggregate positions held by US entities. This was in contrast to data published by the US Office of the Comptroller of the Currency, which showed that, as a result of the merger, the notional amount of exchange-traded and OTC derivatives held by US commercial banks decreased by 12% to $45.4 trillion in the fourth quarter of 2001.

[5] Investors in MBSs face significant prepayment (or convexity) risks since the holders of the underlying mortgages enjoy certain prepayment privileges, such as the ability to refinance their mortgages on more favourable terms when long-term interest rates decline. Such early repayments in turn lead issuers to call MBSs as the underlying pool of mortgages shrinks. In order to protect themselves from a shortening of their portfolios' duration and from a loss of interest income, holders of MBSs can purchase receiver (or call) swaptions enabling them to receive fixed rate payments on pre-agreed terms if their securities are called.

Global over-the-counter (OTC) derivatives markets[1]

Amounts outstanding, in billions of US dollars

	Notional amounts				Gross market values			
	End-Jun 2000	End-Dec 2000	End-Jun 2001	End-Dec 2001	End-Jun 2000	End-Dec 2000	End-Jun 2001	End-Dec 2001
Grand total	94,008	95,199	99,755	111,115	2,572	3,180	3,045	3,778
A. Foreign exchange contracts	15,494	15,666	16,910	16,748	578	849	773	779
Outright forwards and forex swaps	10,504	10,134	10,582	10,336	283	469	395	374
Currency swaps	2,605	3,194	3,832	3,942	239	313	314	335
Options	2,385	2,338	2,496	2,470	55	67	63	70
B. Interest rate contracts[2]	64,125	64,668	67,465	77,513	1,230	1,426	1,573	2,210
FRAs	6,771	6,423	6,537	7,737	13	12	15	19
Swaps	47,993	48,768	51,407	58,897	1,072	1,260	1,404	1,969
Options	9,361	9,476	9,521	10,879	145	154	154	222
C. Equity-linked contracts	1,645	1,891	1,884	1,881	293	289	199	205
Forwards and swaps	340	335	329	320	62	61	49	58
Options	1,306	1,555	1,556	1,561	231	229	150	147
D. Commodity contracts[3]	584	662	590	598	80	133	83	75
Gold	261	218	203	231	19	17	21	20
Other	323	445	387	367	61	116	62	55
Forwards and swaps	168	248	229	217	...	...	...	...
Options	155	196	158	150	...	...	...	...
E. Other[4]	12,159	12,313	12,906	14,375	392	483	417	519
Gross credit exposure[5]	.	.	.	.	937	1,080	1,019	1,171

[1] All figures are adjusted for double-counting. Notional amounts outstanding have been adjusted by halving positions vis-à-vis other reporting dealers. Gross market values have been calculated as the sum of the total gross positive market value of contracts and the absolute value of the gross negative market value of contracts with non-reporting counterparties. [2] Single currency contracts only. [3] Adjustments for double-counting estimated. [4] Estimated positions of non-regular reporting institutions. [5] Gross market values after taking into account legally enforceable bilateral netting agreements. Table 4.1

Euro-denominated interest rate swaps return to growth

Euro-denominated contracts returned to rapid growth following a slowdown in the previous two half-year periods. Here again, interest rate swaps provided much of the impetus behind market expansion, with the stock of contracts rising by 18% to $21 trillion. The market for euro-denominated swaps has developed at an uneven pace in recent years, accounting for much of the variability in the expansion of the OTC market. The stock of euro-denominated swaps grew rapidly in the wake of the introduction of the single European currency, as such instruments became new benchmarks for European fixed income markets. However, this growth slowed considerably in 2000. The slowdown may have reflected the completion of a stock adjustment process to the new integrated euro zone market. The resumption of growth in the second half of 2001 could thus represent a return to more "normal" market activity.

Modest expansion of yen swaps

By contrast, the market for yen-denominated interest rate swaps expanded at a slower pace, with the stock of contracts rising by 4% to $10 trillion. The weakness of overall economic conditions in Japan probably led

market participants to believe that Japanese interest rates would evolve in a narrow range in the foreseeable future, reducing the need to hedge balance sheets and depriving market participants of trading opportunities.

OTC business less active than that on exchanges in 2001

In spite of the recovery observed in OTC markets in 2001, business in such markets remained somewhat subdued compared with that conducted on derivatives exchanges over the same period.[6] The stock of OTC contracts expanded by 11% in the second half of 2001, while open positions in exchange-traded contracts grew by 21%. In the previous half-year period, the stock of OTC contracts had only increased by 5%, while that of exchange-traded contracts had risen by nearly 40%. If sustained, such a rapid rise in exchange-traded activity would represent a significant departure from previous patterns, since the growth of OTC business had outpaced that on exchanges during the previous decade.

Buoyancy of exchange-traded business contrasts with earlier patterns

Sharp rise in gross market values

Estimated gross market values increased by 24% to $3.8 trillion, following a slight contraction in the first half of 2001.[7] At the same time, the ratio of gross market values to notional amounts rose from 3.1% to 3.4%. Allowing for netting, the derivatives-related credit exposures of reporting institutions stood at $1.2 trillion in the most recent half-year.[8]

Eventful period for the credit derivatives market

Recent months have been eventful for the credit derivatives markets, with the default of Argentina and the collapse of Enron leading investors to attach greater importance to the availability of liquid instruments for the hedging and trading of sovereign and corporate risk.

Credit derivatives face teething problems

As is often the case with markets for innovative instruments, credit derivatives were affected by teething problems. In particular, the financial difficulties faced by Argentina, which culminated in the country's default at the end of December 2001, highlighted the need for more precise contract documentation. While Argentina's debt repudiation at the end of last year was a

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[6] It should be noted, however, that activity in the two types of market cannot be directly compared owing to inherent differences in the characteristics and uses of products.

[7] While notional amounts provide a reference from which contractual payments are determined in derivatives markets, such amounts are generally not those truly at risk. The amounts at risk in derivatives contracts are a function of the price level and/or volatility of the financial reference index used in the determination of contract payments, the duration and liquidity of contracts and the creditworthiness of counterparties. Gross market values provide a more accurate measure of the scale of financial risk transfer taking place in derivatives markets.

[8] Gross market values tend to overstate the actual credit exposures faced by counterparties because they do not take into account the availability of legally enforceable bilateral netting arrangements and other risk reduction measures.

A comparison of data sources on credit derivatives

The apparent growth of the market for credit derivatives has generated interest in data shedding light on the evolution of the market. There are a variety of sources for such data, including the BIS, the British Bankers' Association (BBA), the International Swaps and Derivatives Association (ISDA), the US Office of the Comptroller of the Currency (OCC) and a number of trade publications, such as *Risk*. The table below provides information on the various sources of positions data in the credit derivatives market.

Data from these sources cannot be directly compared owing to significant differences in collection methodologies, coverage and frequency. One of the key differences between the various surveys is whether the positions data are adjusted for double-counting. Such an adjustment relies on counterparty information since inter-dealer positions must be halved to avoid double-counting. Obviously, surveys that do not adjust for double-counting tend to show inflated positions relative to those for which such an adjustment is made.

Another important distinction relates to market coverage, in terms of counterparties, geographical areas and products. The coverage by counterparty varies widely, with some sources reporting data for positions held by banks in a given country (such as the OCC for US banks) and others purporting to achieve global coverage (such as the BIS data, which cover activity by a broad range of market participants in almost 50 countries).

Perhaps owing to varying definitions of what constitutes a credit derivative, few data sources publish detailed information on the products covered. Except for the survey conducted by the British Bankers' Association and *Risk*, survey results tend to be highly aggregated.

The frequency with which data are collected varies greatly, ranging from quarterly in the case of the OCC data to triennial in the case of the BIS.

It should be noted that the BIS does not collect data on credit derivatives in its regular semiannual survey of the OTC market. However, aggregate data collected as part of the 2001 Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity showed that positions in credit derivatives rose to $693 billion at the end of June 2001 from $118 billion at the end of June 1998. With growing demand for information on credit derivatives, central banks are considering a more frequent collection of data in the context of the BIS semiannual survey.

Features of various data on credit derivatives

	BBA	BIS	ISDA	OCC	*Risk*
Frequency	Annual	Triennial	Semiannual	Quarterly	Annual
Elimination of double-counting	No	Yes[1]	No	Yes[2]	No
Source of data	BBA member banks	Banks and dealers in nearly 50 countries	ISDA members	US-chartered and insured banks	Large dealers
Beginning of data collection	1997	1998 H1	2001 H1	1997 Q1	1998
Latest period	2000	2001 H1	2001 H2	2001 Q4	2001
Total contracts outstanding in first period	$180 billion	$118 billion	$632 billion	$19 billion	N/A
Total contracts outstanding in latest period	$893 billion	$693 billion	$919 billion	$395 billion	$810 billion

[1] At holding company level. [2] At bank level.

clear triggering event for credit default swaps written under ISDA's 1999 credit derivatives definitions, there was less agreement concerning a $50 billion debt exchange conducted by that country in November 2001.[9] At that time, local investors and financial institutions were offered the possibility of exchanging bonds paying an average interest rate of about 11% for longer-dated securities paying a rate of interest of about 7%. Although the exchange was considered to have constituted a "selective" default by two of the major rating agencies, buyers and sellers of credit default protection came to conflicting interpretations of such a credit event, leading to legal disputes.[10]

Narrower list of credit events

Market participants have recently attempted to further narrow the list of events that could trigger payouts by eliminating so-called "soft" credit events. Such events, which are more akin to credit deterioration than default, have also often been the subject of competing interpretation. In April 2002 European market participants followed the lead taken by US dealers and abandoned two such potential credit events (obligation acceleration and repudiation/ moratorium).

Disagreement remains on restructuring

In spite of these amendments, significant disagreement remains over the issue of debt restructuring. Although credit default swaps can be traded both with and without restructuring clauses, European banks have tended to offer contracts with ISDA's 1999 terminology, while since May 2001 US dealers have been offering contracts with a narrower definition of restructuring.[11]

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[9] ISDA's 1999 definitions set out six credit events that can trigger payment on a credit default swap, namely bankruptcy, failure to pay, obligation default, obligation acceleration, repudiation/moratorium and restructuring.

[10] Some of the transactions, entered into prior to the development of ISDA's 1999 documentation, contained a broad definition of restructuring, which, according to the purchasers of protection, should have triggered a payout. Other transactions were governed by ISDA's 1999 definitions, which included a narrower definition of restructuring, and, according to sellers of protection, should not have given rise to a payout.

[11] The modified clause essentially limits the maturity and type of obligations that are deliverable after the occurrence of a restructuring, thereby reducing the opportunity for buyers of protection to exercise the "cheapest-to-deliver" option under physically settled credit default swaps (the standard delivery procedure in this market).

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The changing information content of market interest rates[1]

Most central banks rely on a variety of information sources in forming their outlook for the economy and, accordingly, assessing the stance of monetary policy. Important among those sources are quotes on financial market instruments, because they are critical links in the monetary policy transmission mechanism, because they embed expectations about the future course of monetary policy and the economy, and because they are available on a real-time basis. However, many different factors potentially influence the prices of financial instruments, including movements in risk-free interest rates, perceptions about the risks of various assets and changes in the value that investors place on liquidity. Thus, extracting information from those prices can be difficult.

This paper attempts to provide some insight into the behaviour of key long-term interest rates in the United States since 1993 by parsing their movements into those of more fundamental underlying factors. In particular, the analysis decomposes the variations in five key market rates into factors representing the risk-free interest rate, liquidity preference and credit risk, as well as idiosyncratic shocks to the Treasury and swap markets. Concentrating on these underlying factors, rather than the market interest rates themselves, brings financial market developments over that period into sharper focus.

The results indicate that the importance of individual factors has shifted in recent years, with significant consequences for the information content of market interest rates and, presumably, the appropriate investment and hedging strategies of private investors. Among other findings, it appears that Treasury yields have varied more as a result of shocks specific to that market in recent years, and that corporate yield spreads have increasingly been affected by factors other than credit risk.

[1] The authors are on the staff of the Board of Governors of the Federal Reserve System. The views expressed in this paper are those of the authors and do not necessarily represent the opinions of the Board of Governors or the BIS. A more extensive version of this paper appears in BIS (2002).

A decomposition of US market interest rates

Several factors influence key US interest rates

Our attempt to identify several fundamental factors that explain the yields on key US fixed income assets focuses on the rates on five different assets with maturities of around 10 years:

- An *on-the-run Treasury yield*, which is the yield on the most recently issued 10-year Treasury note. The amount of trading activity in this security is extensive, and its liquidity is remarkable.[2]
- An *off-the-run Treasury yield*, which is the par yield on a 10-year security derived from a smoothed yield curve estimated from the prices of off-the-run notes and bonds and some coupon strips.[3] While much less liquid than on-the-run issues, off-the-run Treasury securities are still quite liquid relative to other fixed income assets.
- An *agency yield* based on a security issued by the Resolution Funding Corporation (Refcorp).[4] This security is essentially free of credit risk (its coupon payments are backed by the full faith and credit of the US government and the principal payments are fully collateralised by Treasury securities), but it is much less liquid than Treasuries. The Refcorp security is particularly useful for our purposes because of its explicit risk-free status.
- A *swap rate* based on a 10-year interest rate swap, which is the fixed rate one would receive in return for making floating rate payments tied to Libor. Notional amounts of outstanding interest rate swap contracts have grown tremendously in recent years, and market liquidity is generally superior to that of even the most frequently traded corporate bonds.
- A *corporate yield*, which is based on the Merrill Lynch AA corporate bond index. This index is a weighted average of the yields on all outstanding corporate debt securities with a AA credit rating and maturities between seven and 10 years, where the individual securities are weighted by their market capitalisation. The liquidity of the corporate bonds included varies but is generally well below the other assets considered.

The decomposition that follows assumes that the yields on these fixed income assets are influenced by five unobserved factors. The analysis places restrictions on how the factors affect the interest rates considered, which allows the factors to be identified from the co-movements among the observed

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[2] For a more complete discussion of the Treasury market, see Dupont and Sack (1999).

[3] The smoothed yield curve is estimated following the method of Fisher et al (1995). It abstracts from the idiosyncratic features that sometimes affect individual securities and controls for the maturity and coupon of each issue. More details are available in BIS (1999).

[4] The specific security used is the October 2020 Refcorp bond, of which $5 billion were issued in 1990. Because the security is estimated to be about 90% stripped, we consider the yield on the principal strip from this security.

yields. Specifically, the factors are assumed to affect market rates as follows:

Factors include the risk-free rate, liquidity preference and credit risk ...

(i) The 10-year *risk-free rate* is assumed to affect all yields equally. Note that the risk-free rate is not measured by the Treasury rate alone, but is instead defined by the common movements observed across all market yields.

(ii) The *liquidity preference factor* is the only factor that affects the spread between on-the-run and off-the-run Treasury securities, as this spread represents a premium that investors are willing to pay for the greater liquidity of on-the-run issues. We interpret the liquidity factor as reflecting investors' preferences for liquidity rather than shifts in the amount of liquidity.[5] The influence of the liquidity factor on other market yields is determined by the correlation of movements in those yields with the yield spread between on-the-run and off-the-run Treasury securities.

(iii) The *credit risk factor* reflects changes in compensation for bearing credit risk, which could reflect shifts both in the perceived amount of credit risk and in investors' willingness to bear credit risk. This factor pushes up the yields on private securities relative to the risk-free rate by different amounts based on their credit risk. Note that movements in liquidity preferences and idiosyncratic shocks can also affect these spreads, though.

The final two factors are idiosyncratic shocks to Treasuries and swaps, which are identified because they impact only those particular securities:

... as well as idiosyncratic shocks to Treasuries and swaps

(iv) A decrease in the *idiosyncratic Treasury factor* pushes down Treasury yields relative to all other assets, causing all spreads relative to Treasuries to widen. This shock is distinguished from a credit risk shock because it has an equal impact on all spreads to Treasuries, whereas a credit risk shock has a differential impact according to the credit quality of the asset. The idiosyncratic Treasury factor may reflect any benefits to holding Treasury securities that are not shared by other assets, such as their transparency for balance sheet reporting or their widespread use as collateral in derivatives and repo transactions.

(v) The *idiosyncratic swap factor* is identified in a similar manner.

Three of the interest rates included in the exercise – on-the-run Treasury, off-the-run Treasury and Refcorp security – are free of credit risk, yet they can differ from each other considerably. According to the decomposition, one reason why the yields of these securities differ is the differences in their levels of liquidity. In fact, because assets are described by both their risk exposure and their liquidity, the risk-free interest rate can only be defined for an assumed

Assets are described by both risk exposure and liquidity

[5] In effect, we assume that the relative liquidity of on-the-run and off-the-run Treasury securities remained relatively stable over the sample. Of course, the liquidity of these and other securities considered may have shifted, but we do not address that possibility here.

level of liquidity. In the results that follow, we define the risk-free rate as corresponding to the liquidity level of the off-the-run Treasury security.[6]

Even adjusting for liquidity, there is still some difference between the Treasury rates and the risk-free rate, which indicates that some other factor is influencing these yields. In our exercise, we have assumed that this other factor is an idiosyncratic component of Treasury yields.[7] One implication of this assumption is that the risk-free interest rate is not simply given by the return on Treasury securities. Under our decomposition, an investor holding Treasury securities has exposure not just to the risk-free rate, but also to the idiosyncratic Treasury factor. This seems to accord well with recent history: investors holding Treasuries in recent years have clearly been exposed to the risks associated with changes in their supply, as discussed below.

The factors have significant effects on all the assets

The estimated parameters from the decomposition (not shown) are all significant with the expected signs.[8] In particular, the liquidity factor is found to push up agency, corporate and swap yields relative to Treasury yields, while the credit risk factor pushes up both corporate yields and swap rates relative to Treasury yields. Note that swaps are found to have exposure to credit risk, but with a loading on that factor that is only about half that of AA corporate bonds.

The behaviour of the underlying factors

With the model solved, one can describe financial market developments in terms of the underlying factors rather than in terms of market interest rates. The five factors derived from the decomposition are shown in Graph 1.[9] All data are weekly averages of daily rates and cover the period from 6 January 1993 to 5 September 2001.

The risk-free rate varied considerably over the sample

The risk-free rate varied in a fairly wide range over the sample, hitting its peak during the tightening of monetary policy in 1994 and falling to its low during the policy easing in autumn 1998. The other factors were relatively steady up to the first half of 1998, but they have become larger and more volatile in recent years. Three interesting phenomena are evident in these estimated factors, related to changes in their behaviour over time, the

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[6] As a benchmark for pricing other assets, one might want to construct a risk-free rate with the same liquidity loading as the asset being priced. Decomposing market rates into these fundamental factors allows one to do so.

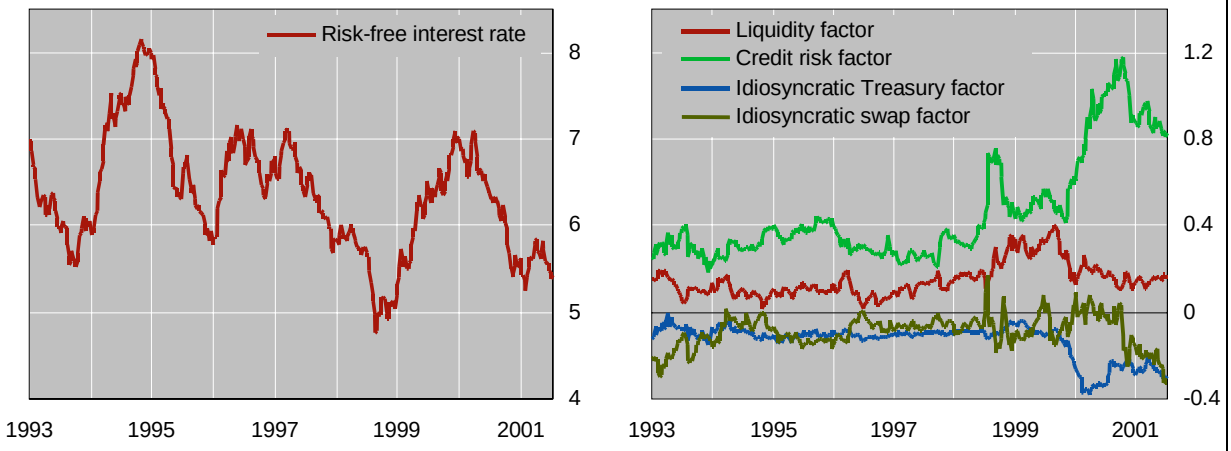
[7] We could alternatively have assumed that an idiosyncratic factor influenced agency yields, but our readings of the market are that Treasury securities had an important idiosyncratic component over the period, which motivated the structure of our model.

[8] For details on the procedure for solving the decomposition, see the more extensive version of this paper. The parameter estimates are given in Table 1 of that paper.

[9] If the factors identified truly represent fundamental influences on asset prices such as liquidity preference, credit risk and risk tolerance, then one would expect them to have some influence on the prices of a wider range of financial assets. One can measure the factor loadings of other assets simply by regressing their yields on our factor measures. In the more extensive version of the paper, we do so for the Merrill Lynch BBB corporate bond index.

The factors underlying market interest rates

In percentages



Graph 1

movement of the risk-free interest rate, and the varying role of credit risk premiums.

Changes in the behaviour of the factors in recent years

Other factors have become more volatile ...

The starting point for the shift in the behaviour of the factors appears to be autumn 1998. The events of that time are well known and have been generally described as a flight to quality.[10] In terms of our model, the flight to quality was evidenced by a sharp increase in both the liquidity preference and credit risk factors. But these factors continued to exert a sizeable influence on market interest rates even after the period of financial market turbulence. The liquidity preference factor remained elevated in 1999 before falling off to some extent in 2000. The credit risk factor instead widened considerably in 2000 in response to the slowing economy and falling stock prices. The idiosyncratic Treasury and swap factors have also become more prominent in recent years, as discussed in more detail below.

The upper portion of the table reports the average levels of all the factors, where the sample is divided into three subperiods to highlight the behaviour of the factors in recent years. The shifts in the size of various factors are evident from the bold entries. Moreover, as indicated in the lower portion of the table, the volatility of many of these factors has increased substantially in recent years. In particular, the liquidity factor was particularly volatile in the 1998–99 subperiod, while the idiosyncratic Treasury factor was more volatile over the period beginning in 2000. In addition, both the credit risk factor and the idiosyncratic swap factor were very volatile during both of the more recent periods.

[10] The events of autumn 1998 are reviewed in detail in CGFS (1999).

Recent behaviour of the factors

In basis points

	1993:1 to 1998:2	1998:3 to 1999:4	2000:1 to 2001:3
Average levels			
Risk-free rate	660	577	613
Liquidity	11	**28**	**16**
Credit risk	31	**51**	**90**
Idiosyncratic Treasury	–10	–9	**–28**
Idiosyncratic swap	–10	–7	–9
Average weekly changes			
Risk-free rate	8.0	8.6	7.5
Liquidity	1.0	**1.9**	**1.3**
Credit risk	1.6	**2.5**	**3.1**
Idiosyncratic Treasury	0.9	0.7	**1.3**
Idiosyncratic swap	1.3	**3.3**	**2.9**

... which accounts for the sharp rise in the volatility of spreads

The behaviour of these factors accounts for another interesting development in US fixed income markets in recent years – the sharp increase in the volatility of the yield spreads across many different US fixed income securities, as shown in Graph 2. The volatilities of these yield spreads jumped in the more recent subperiods to several times their earlier levels, even though the volatilities of the rates themselves changed only modestly. The factor decomposition offers some explanation of these patterns. The volatility of the risk-free rate – the common component of all yields – did not change much, thus keeping the volatilities of all of the market interest rates relatively steady. However, the increase in the volatilities of other factors in the more recent periods produced greater variation in yield spreads.

Tracking the risk-free interest rate

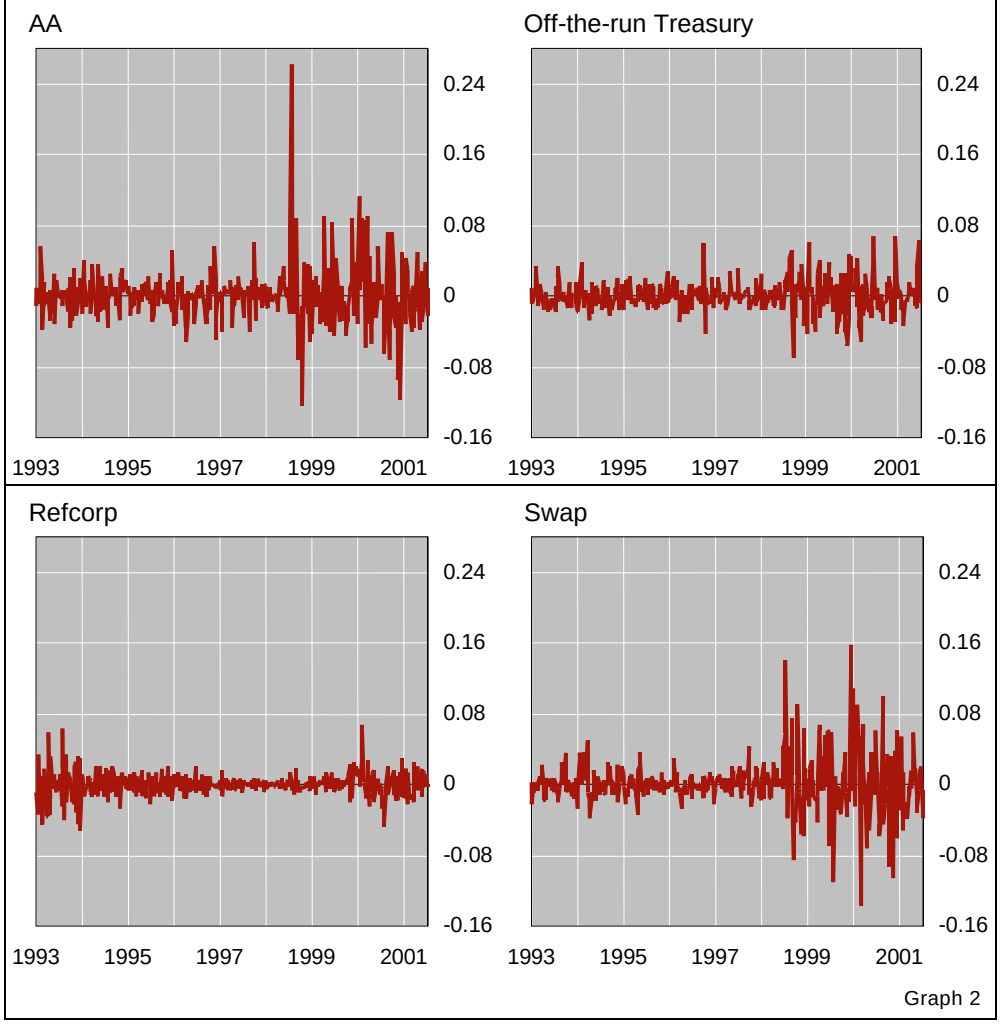
Greater idiosyncratic variation has pushed the Treasury yield away from the risk-free rate

Over much of the sample, the yield on the off-the-run Treasury security provided an effective measure of the 10-year risk-free interest rate. Recall that the Treasury yield deviates from the risk-free rate by the idiosyncratic Treasury factor. This factor was remarkably flat from 1993 to 1999, leaving the Treasury rate below the risk-free rate by a nearly constant amount, as is apparent from Graph 3.[11] However, as shown in the table, the idiosyncratic Treasury premium has become much larger since 2000, pushing the Treasury rate down relative to other market interest rates and increasing the wedge between the Treasury

[11] Because there is no idiosyncratic factor affecting the Refcorp yield, any portion of the spread between the Refcorp and the off-the-run Treasury yields not explained by liquidity must be attributed to the Treasury factor, which pushes it away from the risk-free interest rate by this constant amount. However, the more interesting focus of the model is on the movements in the factors, not on the constant terms.

Spreads versus on-the-run Treasury yields

In percentage points



Graph 2

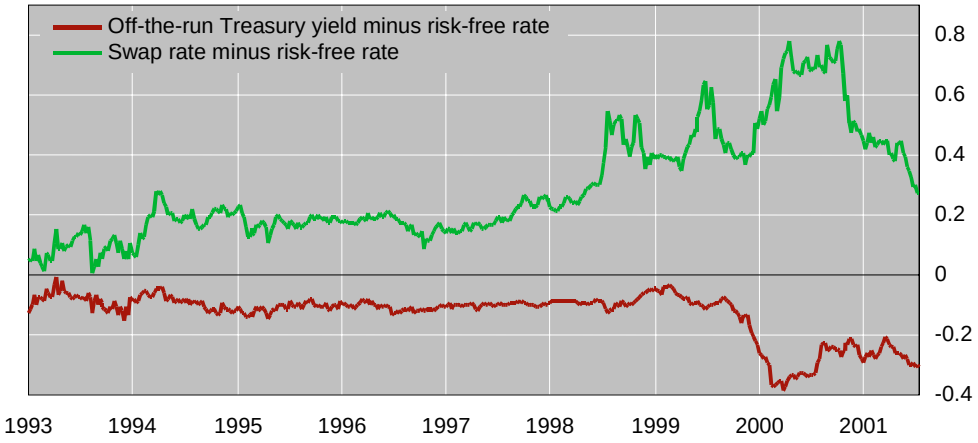
yield and the risk-free interest rate.[12]

The decline in Treasury yields relative to all other market yields in early 2000 may have resulted from a "scarcity premium" on Treasury securities. Indeed, the publication in early 2000 of the Congressional Budget Office's forecasts for sizeable surpluses over the coming decade and the Treasury's implementation of a debt buyback programme and other debt management decisions seemed to focus the market's attention on the possibility that the Treasury would pay down its outstanding debt over the coming decade. Concerns that Treasury securities would become increasingly scarce appeared

[12] A research report by Lehman Brothers (see Kocic et al (2000)) reaches a similar conclusion using a different methodology. They assume that the risk-free rate is a random walk and apply a Kalman filter approach, controlling for liquidity and credit risk in a manner similar to ours.

Tracking the risk-free rate: Treasuries versus swaps

In percentage points



Graph 3

to strongly affect the yields of those securities, particularly at longer maturities where fewer safe and liquid substitutes are available.[13]

The larger idiosyncratic premium on Treasury securities raises the question of whether some other asset could serve as a better proxy for the risk-free interest rate. Indeed, there has been considerable discussion about a possible transition to interest rate swaps as a "benchmark" for the pricing and hedging of other fixed income assets. Our results indicate that the swap rate is not a precise proxy for the risk-free rate but, rather, does include some compensation for credit risk, albeit less than most corporate bonds.[14] Indeed, the swap rate has deviated from the risk-free rate by more than the Treasury rate in recent years (Graph 3), reflecting the impact of the credit risk and liquidity factors.

The swap rate is not a precise proxy for the risk-free rate ...

Of course, the fact that swaps have some credit risk may be an important advantage in becoming a benchmark for the pricing and hedging of private instruments. Much of the discontent with intermediate- and longer-term Treasuries as hedging instruments began in autumn 1998, when the flight to quality discussed above pushed down Treasury yields and pushed up lower-rated corporate yields. Unlike Treasuries, swaps have exposure to both the credit risk and the liquidity preference factors, the two factors influenced by the flight to quality, which makes them more comparable to corporate bonds. Thus, swaps may well have provided a better hedge for corporate bonds during that period.

... but swaps may provide a better hedge for private debt instruments

Nevertheless, swaps appear to also have a significant idiosyncratic factor that reduces their effectiveness as a hedging instrument, and that component

[13] See Reinhart and Sack (2000) for a discussion of the implications of the paydown of US government debt.

[14] Conversely, Kocic et al (2000) argue that swaps have become a better proxy for the risk-free rate than Treasuries.

became larger in 2001 (Graph 1) for reasons that are not obvious. One conjecture is that the increased use of swaps as hedging instruments may have caused their rates to be increasingly influenced by the amount of corporate bond issuance or prepayment risk on mortgage-backed securities. In addition, the government-sponsored enterprises (GSEs) have reportedly been very active in the swaps market in recent years. Changes in their behaviour or strategies could introduce variation in swap rates that would be viewed as idiosyncratic in this model.[15]

It is possible that some of the idiosyncratic variation in Treasury yields has diminished more recently. Indeed, the fiscal outlook shifted substantially in late 2001 in a manner that should make the paydown in Treasury debt less rapid and more uncertain.

The determinants of corporate yield spreads

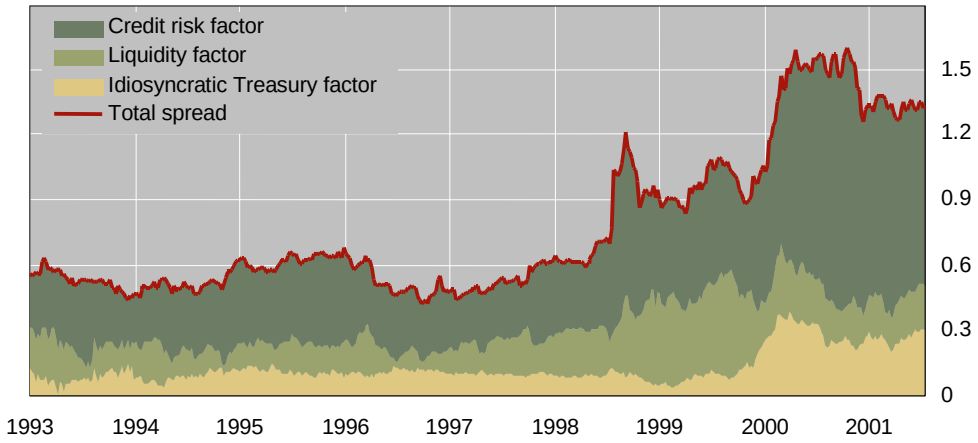
Corporate spreads are increasingly influenced by factors other than credit risk

Spreads between various yields have become harder to interpret in recent years because they have been increasingly influenced by a number of different factors. Graph 4 shows the factor decomposition for the AA corporate yield spread measured relative to on-the-run Treasury securities.

The credit risk factor accounted for a sizeable portion of the average yield spreads from 1993 up to the first half of 1998. The AA yield spread jumped higher from the second half of 1998 to the end of 1999, but the heightened preference for liquidity over this period contributed as much to the widening of the spread as did the increase in credit risk. Over the period beginning in 2000,

Decomposing corporate spreads

Decomposition of AA spread over on-the-run Treasury yields, in percentage points



Graph 4

[15] If we regress the yield on the 10-year Fannie Mae benchmark security since 1998 (the beginning of that programme) on the five factors, we find that the swap factor enters with a strongly significant coefficient. This supports the notion that there is some linkage between the swap factor and the behaviour of the GSEs.

the yield spread again increased sharply. According to the results, the credit risk factor accounted for most of the increase in spreads, although the idiosyncratic Treasury factor at that time added about 20 basis points to the average widening of spreads. Overall, these results emphasise the importance of considering factors other than credit risk for interpreting corporate yield spreads, as both liquidity and Treasury-specific factors have strongly influenced corporate yield spread movements in recent years.

Conclusions

This paper argues that movements in the fundamental factors influencing market interest rates are more informative than the market rates themselves. We derive five fundamental factors based on the co-movements of the yields on different types of US fixed income assets. Those factors offer a clearer interpretation of market events since 1993, which could potentially provide monetary policymakers with a more useful set of information for formulating appropriate policy decisions. Similarly, market participants would also benefit from understanding the fundamental factors driving movements in fixed income prices, which would allow them to more accurately assess the risks and potential rewards associated with their investment and hedging strategies.

Significant shifts in the importance of the underlying factors have taken place in recent years, with important consequences for interpreting market interest rates. Overall, the increased variation of a number of different types of shocks in recent years has made it more difficult to derive information from individual market rates or spreads. Two examples are highlighted in the paper: Treasury yields became increasingly separated from the risk-free interest rate, and corporate yield spreads were increasingly influenced by shocks other than credit risk. As a consequence, policymakers and investors should rely more heavily on using the co-movements in yields across a number of different securities to effectively identify movements in the fundamental factors that drive the markets.

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What's behind the liquidity spread? On-the-run and off-the-run US Treasuries in autumn 1998[1]

Autumn 1998 witnessed the Russian sovereign default and the near collapse of the hedge fund Long-Term Capital Management. These two events were part of a generalised flight to liquidity that affected markets worldwide. In an in-depth analysis of the unique market events of that time, the Johnson Report identified ways in which market strains were exacerbated during the period.[2] In particular, various yield spreads widened, including spreads between off-the-run and on-the-run Treasuries. Although movements in the so-called liquidity spread have attracted much attention as a way to track shifts in market liquidity, there has been little careful analysis of the trading activity that lay behind the dramatic movements of 1998.

In this special feature, we find that trading activity in off-the-run Treasuries actually increased during autumn 1998, a fact that would appear to contradict the evidence derived from liquidity spreads, which seemed to indicate reduced liquidity for these securities. We then examine trading activity more closely by focusing on only the most recently off-the-run security and by accounting for anticipated factors that affect trading, including the auction cycle, announcement events and days of the week. Once these factors are isolated, we do find evidence that there was a marked shift in trading away from the off-the-run issue. We then examine the impact of trades on price movements in both the on-the-run and first off-the-run five-year note. We find that the impact of trades on both securities became stronger during autumn 1998, an indication of reduced liquidity for both securities. The increase in the price impact, however, was more pronounced for the off-the-run note. During this period of stress, the impact of trades on the price of the off-the-run note strengthened tenfold while that on the on-the-run note only doubled.

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[1] The views expressed in this article are those of the authors and do not necessarily reflect those of the Bank for International Settlements. Anna Cobau provided expert statistical help.

[2] See CGFS (1999). Upper (2001) documents similar phenomena in the German market. Borio (2000) explores related issues, particularly the role of cash constraints and counterparty risks in exacerbating these strains.

Movement of the liquidity spread in 1998

The liquidity spread subtracts the on-the-run yield ...

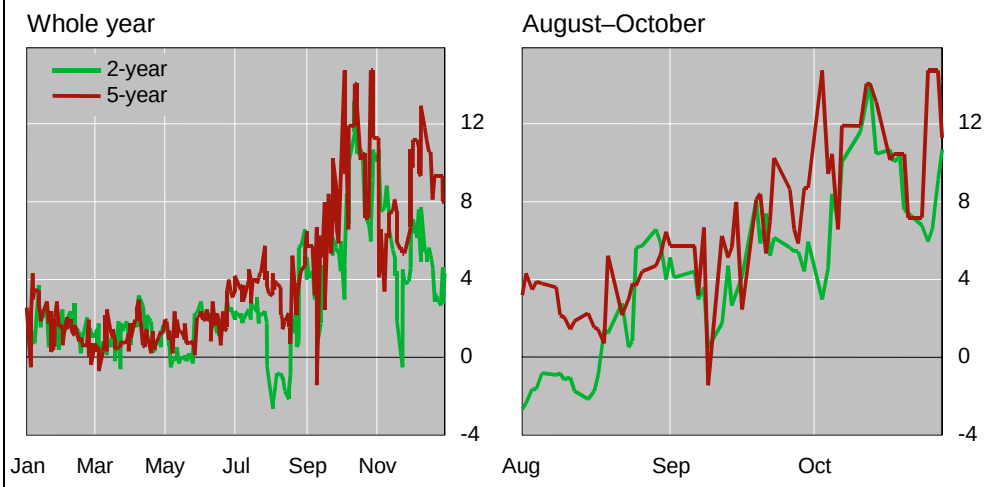
We rely on trade by trade data from the inter-dealer market for US Treasury securities. These data come from GovPX, Inc., a joint venture of the primary US dealers and inter-dealer brokers, and contain information on each quote, purchase and sale in the US Treasury market that was transacted through any of five of the leading six inter-dealer brokers in the market. The data identify by CUSIP number the particular security of a given original maturity that is currently "on-the-run", ie the most recently issued security of a given original maturity. All other securities of the same original maturity are collectively defined to be "off-the-run" regardless of actual remaining time to maturity.

... from the first off-the-run yield

To construct our measure of the liquidity spread, we calculate the daily average transaction yield of the on-the-run security and subtract this from the similarly constructed yield of the first off-the-run security, ie the yield on the most recently on-the-run.[3] Thus, for a security with a quarterly auction cycle, the difference in remaining maturities between the two instruments is three months.[4] The left-hand panel of Graph 1 indicates the movement of this spread for the two- and five-year notes in 1998,[5] as well as illustrating many features

The liquidity spread in 1998

In basis points



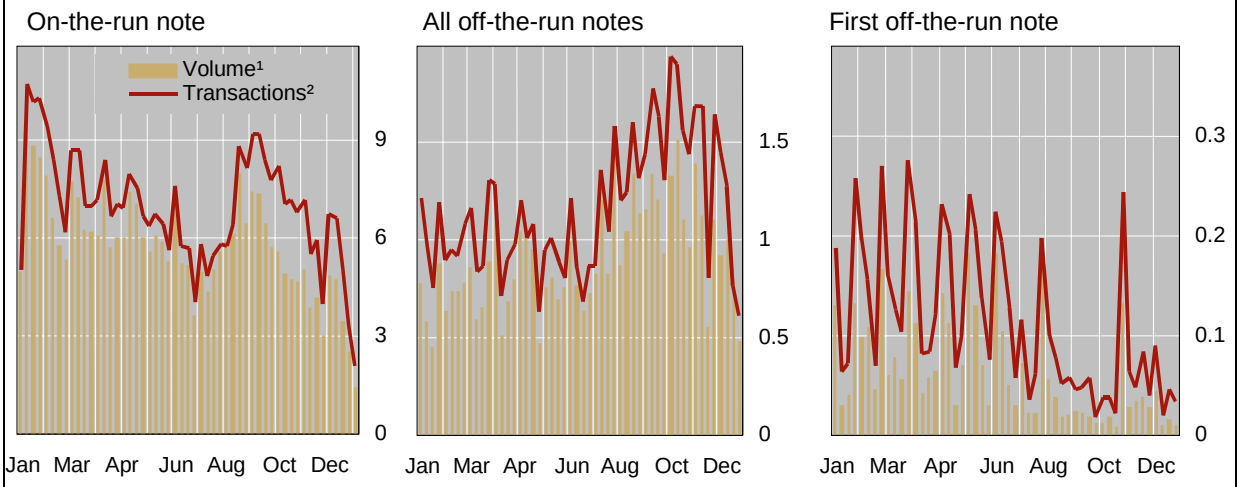
Sources: GovPX, Inc.; BIS calculations. Graph 1

[3] Note that this is slightly different from the way Reinhart and Sack (2002) calculate their "liquidity preference factor". Their "off-the-run Treasury yield" is the par yield from a curve fitted to the prices of off-the-run notes and bonds and some coupon strips (see page 41, including footnote 3, in this *Review*), while our off-the-run yield is the yield on a specific security. While they focus on the 10-year maturity, we focus on the two-year and five-year maturities, for which we have better high-frequency data.

[4] If there is a term premium for the slight difference in maturity, our calculated liquidity spread will be smaller than otherwise, but this should not affect our analysis of *movements* in this spread.

[5] For the remainder of the feature, we use the five-year note as illustration, but similar qualitative findings were obtained for the two-year note. The off-the-run 10-year note was not sufficiently traded in GovPX to allow us to conduct an analysis at this maturity.

Trading of five-year notes in 1998



[1] Average daily volume during the week; in millions of US dollars. [2] Average daily number of transactions during the week; in hundreds.

Sources: GovPX, Inc.; BIS calculations. Graph 2

of the liquidity spread that have been documented extensively elsewhere. In particular, the spreads for both maturities were narrow throughout the first half of 1998, only rarely exceeding 4 basis points in magnitude. Beginning in August, however, the spread began to widen, reaching 15 basis points for the five-year note in October. Remarkably, the spread often *widened* by more in a single day than the level of the spread had been earlier in the year. On 27 October alone, for example, the liquidity spread widened by nearly 8 basis points.

The spread widened to 15 basis points in October 1998

Treasury market activity during 1998

Trading volume is often used as a proxy for market liquidity. To the extent that volume serves this purpose, one might have expected the US Treasury market to witness a decline in trading activity, at least for off-the-run issues, during the flight to liquidity in autumn 1998. The on-the-run issue, however, is often thought of as the instrument of choice during liquidity crises. In this case, it is to be expected that flights to liquidity would be associated with an increase in on-the-run trading.

Trading in on-the-run securities rose during the crisis ...

Trading intensity did increase dramatically for the on-the-run security during the crisis period. As indicated by the left-hand panel of Graph 2, the five-year on-the-run Treasury averaged 758 transactions per day during New York business hours during the first half of 1998. This was at a time when the Treasury market was experiencing a general decline in trading activity, as witnessed by a discernible downward trend in activity over the year as a whole. By June 1998, the same security averaged only 622 transactions a day. During the crisis period, however, trading in on-the-run Treasuries intensified. The five-year note averaged 715 daily transactions between 1 August and 30 November. Focusing on the period from the Russian default announcement on 17 August to the Federal Reserve's surprise inter-meeting cut in the target

federal funds rate on 15 October, trading intensity of the five-year on-the-run Treasury was even higher, averaging 826 daily transactions during business hours. Furfine and Remolona (2002) have documented similar patterns for on-the-run Treasuries of other maturities.

... and so did trading in off-the-run securities

What is perhaps surprising is that trading in off-the-run Treasury securities also appears to have risen during the crisis period. From the middle panel of Graph 2, it is hard to discern a decline in the volume of trading activity across all off-the-run five-year Treasuries during the first half of the year. What is more apparent is that off-the-run trading was far less intense between January and June, averaging only about 100 transactions per day, than later in the year. In fact, trading activity in off-the-run five-year Treasuries increased to 150 transactions a day between the Russian default and the surprise interest rate cut by the US Federal Reserve. We are unable to account for this pattern, in part because the data cover all the off-the-run five-year notes regardless of remaining maturity.

A shift in trading?

To make the analysis of trading patterns more tractable, we now focus only on the trading patterns of the individual securities that we used to determine the liquidity spread. The right-hand panel of Graph 2 details the daily trading activity in the first off-the-run security, which is the one used in calculating the spread. It is evident that for a given off-the-run security there are sharp spikes in activity. These spikes appear to be related to the auction cycle, and the five-year note changed from a monthly issuing cycle to a quarterly cycle in August 1998. Trading activity in the first off-the-run security is at its highest on the day of the auction for the next on-the-run security of that maturity. This may be because dealers wait for auction information before they sell the latest off-the-run to make room for the new on-the-run. This issuance-related trading activity is also discernible for the on-the-run security shown in the left-hand panel of Graph 2, but is less apparent because trading in the on-the-run security is active during the entire period for which the security is on-the-run. Note that there is no apparent issuance-related movement in the liquidity spread. That is, market participants understand that when a new five-year security is issued, the trading in the previously issued security will fall rapidly over a few days, but prices will adjust immediately.

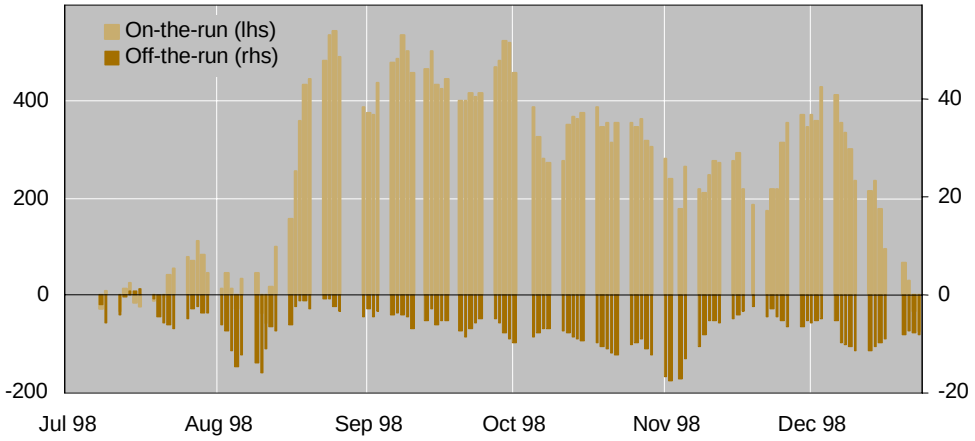
The auction cycle produces spikes in trading ...

... so we adjust for these

To facilitate an analysis of shifts in market activity related to the crisis in 1998, we first try to account for the issuance-related movements in trading activity, particularly for the security that has just become off-the-run. For both the on-the-run and most recent off-the-run security, we fit a regression model to explain trading activity during the first half of 1998. The dependent variable in the regression is the number of transactions for the given security on the given day. To control for the auction cycle, we employ dummy variables for each of the first seven trading days after the auction. We find no significant auction cycle effects beyond the seventh day. We further add dummy variables

Excess trading of on-the-run and off-the-run notes

Actual minus forecast transactions;[1] five-year notes



[1] Forecast obtained by regressing the number of transactions on dummy variables controlling for the first seven days after an auction, for the days of the week and for major scheduled macroeconomic announcements.

Sources: GovPX, Inc.; BIS calculations. Graph 3

for days of scheduled announcements of major economic news.[6] Finally, we similarly control for day-of-the-week effects and a potential time trend.

A shift in trading is apparent ...

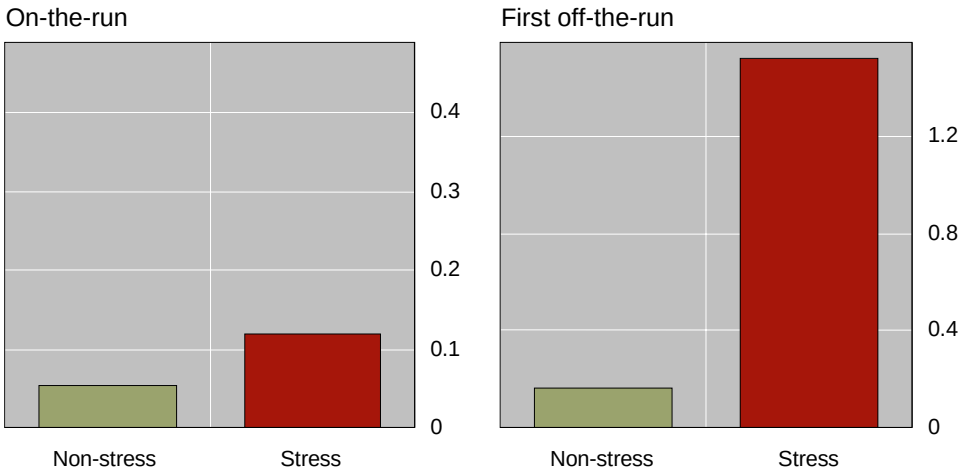
Once we control for the issuance cycle and other anticipated events, it becomes apparent that trading activity did indeed shift from off-the-run to on-the-run Treasury securities during the crisis period of autumn 1998. With the regression estimated on data for the first half of 1998, we forecast Treasury market trading for both the on-the-run and the first off-the-run five-year notes for the latter half of the year. Graph 3 plots the residuals from these regressions, which we call the "excess" trading volume. The small values of the residuals for the on-the-run note indicate that trading volume in this security was close to what would have been expected from July until early August. Beginning in mid-August, trading volume in the on-the-run five-year Treasury note increased far beyond what would have been expected. At times, more than 500 "excess" transactions occurred for the on-the-run note. By contrast, the residuals from the transaction forecast of the off-the-run security are almost exclusively negative, indicating that, relative to what one would have predicted, trading in off-the-run Treasury notes was lower during the latter half of 1998. Thus, there does seem to be some evidence that market participants increasingly wanted to trade the on-the-run Treasury issues during the crisis period of autumn 1998.

... with less activity in the off-the-run note

[6] The announcements considered were employment, CPI, PPI, retail sales and NAPM (now known as the ISM survey). Fleming and Remolona (1999a) and Furfine (2001) find these to be the major announcements, while Fleming and Remolona (1999b) find elevated trading in the market on these announcement days.

Price impact of trades:[1] normal versus stress periods

In basis points; five-year notes



[1] Based on regressions of daily yield changes on net buys during the period, with dummy variables controlling for the first seven days after an auction, for the days of the week and for major scheduled macroeconomic announcements.

Sources: GovPX, Inc.; BIS calculations. Graph 4

The price impact of trades

The price impact of trades measures liquidity inversely

A further measure of liquidity is the impact of trades on prices. While in general purchases would tend to raise prices and sales lower prices, we should find these price effects to be weak in a liquid market. In the case of the US Treasury market, off-the-run securities are considered much less liquid than on-the-run securities and the price impact of trades should be stronger for the former than for the latter. The question we ask here is: what happened to these effects during the crisis period of autumn 1998?

To assess liquidity during the crisis period, we compare daily changes in the yields of the on-the-run five-year US Treasury note with the corresponding daily yield changes of the first off-the-run five-year note. Specifically, we regress these yield changes on the "net buys" during the trading day for corresponding securities while controlling for macroeconomic announcements, days of the week and the auction cycle. The "net buy" variable is the number of buyer-initiated trades (or "takes") minus the number of seller-initiated trades (or "hits") for a given trading day. This variable is analogous to the direction-of-trade variable that Hasbrouck (1991) introduced, a variable that has become standard in the literature. We account for the effect of the crisis by interacting a dummy variable with the "net buy" variable, where the dummy variable defines the crisis period as 17 August to 15 October 1998.

The crisis makes that impact stronger ...

Our results indicate a significant decline in liquidity during the crisis period for both securities. Moreover, the decline in liquidity is proportionately greater for the off-the-run note than for the on-the-run note. In Graph 4, the left-hand panel compares the price impact of trades on the on-the-run note during normal trading days with that on stress days, where stress days are those during the crisis period. The impact is shown to more than double during stress

days, a result that suggests that liquidity declined even for a security that is supposed to have been favoured by the flight to liquidity. The right-hand panel shows a similar comparison for the off-the-run note. When comparing the green bars in the two panels, and taking account of the different scales, the impact is stronger for the off-the-run note, confirming the relatively poor liquidity for this security. The crisis served to make the impact of trades on the price of this security nearly 10 times stronger, indicating a loss in liquidity for the off-the-run note that was much greater than for the on-the-run note. Hence, while the widening of the yield spread reflected a loss of liquidity in the off-the-run note *relative* to that of the on-the-run note, it also seems that liquidity in *both* securities declined.[7]

... but especially for the off-the-run note

Conclusion

In this special feature, we reconcile the evidence on yield spreads between off-the-run and on-the-run Treasury securities, on their trading activity and on the price impact of trades during the crisis period of autumn 1998. While the widening of spreads during the period suggested a shift in liquidity from off-the-run to on-the-run securities, we find that in fact trading activity in both types of securities increased. However, by focusing on only the first off-the-run security and by accounting for anticipated factors that would affect trading – notably the auction cycle – we do find that there was a marked shift in trading activity towards the on-the-run issues. By examining the impact of trades on price movements in both the on-the-run and first off-the-run five-year notes, we find in common a stronger price impact during autumn 1998, indicating that liquidity declined in both securities. The increase in the price impact, however, was more pronounced for the off-the-run note. Hence, the widening of the spread indicated not an absolute shift in liquidity from off-the-run to on-the-run Treasury securities but an overall loss of liquidity in both securities, with the off-the-run security being particularly affected.

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[7] Note that liquidity is defined differently here from Reinhart and Sack (2002). To them, the "liquidity preference factor" refers to the strength of demand for *holding* the on-the-run security, while we define liquidity in terms of the ease of trading.

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Positive feedback trading in the US Treasury market[1]

Government bonds are at the heart of the global financial system. Because they usually represent the most creditworthy obligations in the economy, they are commonly used as benchmarks for pricing other obligations, as vehicles for hedging against changes in broad levels of interest rates, and as collateral for credit exposures. In recent years, other instruments have also begun to perform some of these functions. For example, interest rate swap yields have become pricing benchmarks in many fixed income markets, and exchange-traded derivatives such as futures and options have steadily gained importance as hedging vehicles.[2] Nevertheless, government bond markets continue to play a central role in virtually all of the major economies.

Any disruption to the trading or pricing of government bonds, such as happened at certain points during the market turbulence that followed Russia's default in August 1998, has the potential to spread rapidly and to disrupt market functioning throughout the financial system (CGFS (1999, 2001) and Borio (2000)). The use of government securities as hedging vehicles means that price movements in related markets, such as those for bond options or mortgage-backed securities, can sometimes cause unexpectedly sharp movements in cash bond prices as well. Research on these dynamics has been limited; two recent examples are Kambhu and Mosser (2001) and Fernald et al (1994).

Despite the systemic importance of government bond markets, relatively little is known about how price discovery takes place in these markets. This note examines one aspect of the price discovery process in the US Treasury bond market, namely the short-term interactions between market prices and new buy and sell orders. Confirming the results found by other researchers, we find that trades have a strong impact on prices, and that this impact is stronger on days when trading is relatively rapid and volatile than it is on quieter days. However, we also find that traders tend to reinforce price movements by buying

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[2] Wooldridge (2001), McCauley (2001) and BIS (2000 pp 116–18, 2001) look at shifts in the use of government bonds as benchmarks in fixed income markets.

when prices rise and selling when they fall, at least in the very short run. Moreover, this tendency is somewhat stronger in more volatile trading conditions.[3] This second result is familiar to market practitioners, but has not yet been conclusively documented in the scholarly literature. A concluding section discusses some of the implications of this result for market functioning.

Past research on price discovery

Past research has looked at how order flow influences prices …

One of the principal findings of researchers in the area of market microstructure is that order flow – the balance of orders for purchases and sales of financial assets received by dealers over a specified period of time – contains information that is rapidly incorporated into market prices.[4] This has been found to be the case for numerous markets, including equities (Hasbrouck (1991)) and foreign exchange (Evans and Lyons (2002)). Fleming (2001) tests this result for the US Treasury market. Using data for the period from 30 December 1996 to 31 March 2000, he finds that order flow during a given five-minute price interval does indeed have a significant impact on price changes during the same interval for on-the-run (recently issued) Treasury securities.

Theoretical researchers such as Glosten and Milgrom (1985) and Kyle (1985) view this effect as stemming from the presence of both informed and uninformed traders in the market. A dealer who receives a new buy order may not know whether the order actually reflects an accurate valuation of the asset being traded, but as long as there is a sufficient possibility that this is the case the dealer will respond to a new buy order by increasing the price that is quoted to subsequent traders. Similarly, a new sell order should lead to a lower price quote.

… but Treasury prices sometimes move sharply without a change in order flow

Yet it is also the case that US Treasury prices can change dramatically without any trading. Fleming and Remolona (1999) find that a scheduled public announcement of macroeconomic data tends to be immediately followed by a near-instantaneous change in bond prices and a severe *decline* in trading volume. This is followed by a period of higher trading volume and much smaller price changes as investors adjust their positions based on their differing interpretations of the news.

If price changes can be exogenous in this way, this raises the question of what this means for market dynamics, and specifically the effect of price changes on trades. Hasbrouck (1991) finds evidence of negative feedback from price changes in the US equity market. Examining intraday trades and quotes of the common stock of a US department store, he finds that price increases tend to be followed by increased selling activity, and price decreases by increased buying activity. He views this as resulting from a number of possible

[3] A more detailed econometric analysis of trade-quote interactions in the US Treasury market, including how and why these patterns differ depending on market conditions, can be found in Cohen and Shin (forthcoming).

[4] O'Hara (1995) surveys the academic literature on market microstructure. See CGFS (2000) for a discussion of policy issues related to market microstructure and bond market liquidity.

causes, including measurement error, stale quotes, inventory control and price experimentation. As will be discussed below, we find the opposite result for the US Treasury market: price increases tend to be followed by relatively more buying and decreases by relatively more selling. A possible explanation for this, also discussed below, is that changes in prices change the perceived risk attributes of a given exposure, and that institutional characteristics of bond trading operations require a rapid adjustment of one's position in response.

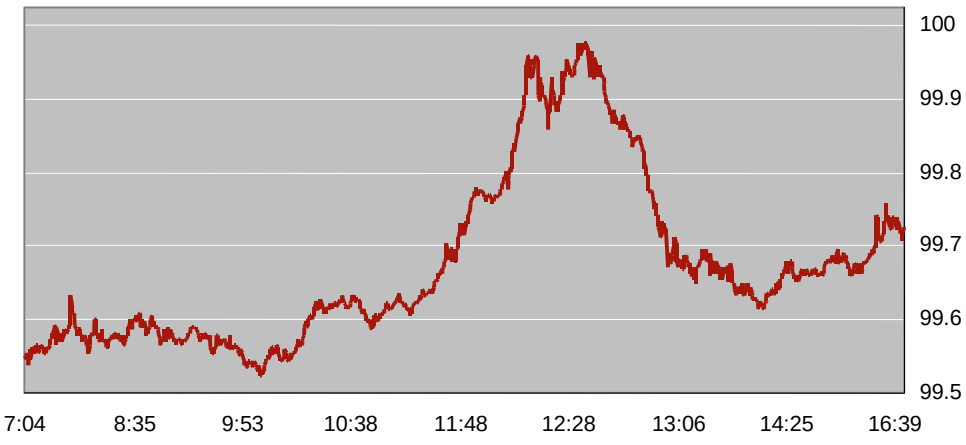
A case study: 3 February 2000

Our study of the US Treasury market, like those by Fleming (2001) and Fleming and Remolona (1999), uses data from GovPX, Inc., a consortium of inter-dealer brokers. For each outstanding Treasury security, GovPX posts the best available bid and offer prices from participating dealers, along with the amount the dealer is willing to trade, on a trading screen which is accessible to subscribers. The screen also records when a trade is executed, the amount traded, and whether the trade was initiated by the buyer of the securities or the seller. Each "tick" in the GovPX data represents either a new bid price, a new offer price, a trade, or some combination thereof. Normally, the time from one tick to the next is about one minute. According to Fleming, trading on GovPX represented about 42% of daily market volume in the first quarter of 2000, with a greater coverage at shorter than longer maturities.

The interactions between prices and trades are often complex

GovPX data for 3 February 2000 provide an example of the complexities of trading interactions in the Treasury market (Graph 1). During trading hours on the previous day, the US Treasury had announced a change in issuance procedures which was expected to result in a sharply reduced supply of 30-year bonds. This led to a rally in the price of the 30-year bond and a great deal of price volatility at other maturities. During the morning of the 3rd, rumours circulated that the Federal Reserve Bank of New York was organising a rescue for a large trading institution that had suffered severe losses, and that the institution would be forced to liquidate its short positions. This led to a rally in

Price of two-year US Treasury note, 3 February 2000[1]



[1] Midpoints of prevailing bid and ask quotes.

Sources: GovPX, Inc.; authors' calculations. Graph 1

Trading epochs for two-year US Treasury note, 3 February 2000				
	Return[1]	Percentage buys	Mean time between ticks (minutes)	Mean bid-ask spread[2]
7 am–11 am	0.00063	52.6	0.61	0.0097
11 am–12.15 pm	0.00340	65.9	0.53	0.0102
12.15 pm–2 pm	–0.00317	40.9	0.48	0.0181
2 pm–5 pm	0.00090	66.7	0.96	0.0120
Memo: *Full sample (1/99–12/00)*	*0.00067*[3]	*52.9*	*0.98*	*0.0065*

[1] Log change in quote midpoint. [2] Difference between prevailing ask and bid quotes. [3] Mean absolute value of daily log quote midpoint changes.

Sources: GovPX, Inc.; authors' calculations.

Treasury prices along the entire yield curve. Around 12.30 pm, the Fed publicly denied that such a rescue was taking place. This led to an immediate and very steep drop in Treasury prices, followed by a mild recovery.

Order flows are not the whole story

The trading atmosphere on 3 February 2000 was clearly one of great uncertainty. A view of market microstructure that emphasises the role of order flow in transmitting information would predict that the upward and downward movements in Treasury prices corresponded to greater order flow, with more buyer-initiated trades when the price rose and more seller-initiated trades when the price fell. This is confirmed by the 3 February data – up to a point (see table). There are more buys than sells during the period of the strongest upswing, from 11 am to 12.15 pm. Yet the imbalance between buys and sells is even greater from 2 pm to 5 pm, when prices rose by only a quarter as much. Furthermore, when one examines these data in more detail, it proves hard to associate the turning points in the price series with specific clusters of buy and sell orders. It appears that, while the order flow hypothesis has some truth to it, there are also other factors at play.

Interactions between trades and prices

To gain a broader understanding of these issues, we study trading activity in the on-the-run two-year note during normal trading hours (7 am to 5 pm) on all business days in the period from 4 January 1999 to 29 December 2000. This was an especially interesting period for the US Treasury market, because mounting fiscal surpluses had led to a decline in new issuance and, some observers claimed, a decline in liquidity in certain market segments. GovPX provides 358,361 ticks of data on the two-year note on the 501 business days during this period. Of this total, 40% represent trades without a change in quotes, 49% changes in the prevailing quote without any trade, and 11% trades accompanied by a change in the prevailing quote.

Analysing these data through econometric methods in Cohen and Shin (forthcoming), we find that not only does order flow cause price changes in the

predicted way (with buying causing prices to rise and selling causing prices to fall), but in some circumstances price changes are followed by trades in a way that reinforces these effects (with price increases causing more buying and decreases causing more selling). This effect becomes more pronounced in relatively volatile trading conditions, especially for the on-the-run two-year note. These results derive from a vector autoregression analysis similar to the one used by Hasbrouck (1991) in his study of the equity market. In this section, we will illustrate these effects using a less technical analysis of the data.

For the two-year US Treasury note, the price impact of order flow …

To begin with, it is clear that buys tend to be followed by a small but pronounced positive return, while sells tend to be followed by a negative return. In other words, we confirm the order flow effect that has now been verified for several classes of financial instruments. During the 20 ticks following a new buyer-initiated trade, a period of time lasting about 19.6 minutes, the price of the on-the-run two-year Treasury note rises by an average of 0.0028%.[5] During the 20 ticks following a new sell, the price falls by an average of 0.0033%. For comparison, the average absolute value of daily returns during the sample period is 0.0667%. A new buy or sell order thus induces a price movement that is about 5% of the total change in prices that takes place in an average trading day.

To see how the price impact of a trade changes depending on trading conditions, it is instructive to divide the 501 trading days in the sample into "active", "normal" and "quiet" days. This corresponds to the tendency for market participants to characterise a given day's trading as being unusually turbulent or unusually calm, because the influence of a statistical release or other news event tends to last throughout the trading day. Our criterion for assigning days to these three groups is a measure of the average time between ticks, with adjustments for the time of day, month of the year and long-term trends in the data. Active days are those where price quotes are changed frequently and trades occur rapidly, while quiet days see less frequent quote changes and slower trading. The active days will be defined as the 50 days (10% of the sample) when this time gap was at its shortest; on these days, new trades or quotes arrived every 40 seconds or so. On quiet days, the 50 days when this gap was longest, the time between ticks averaged about two minutes.

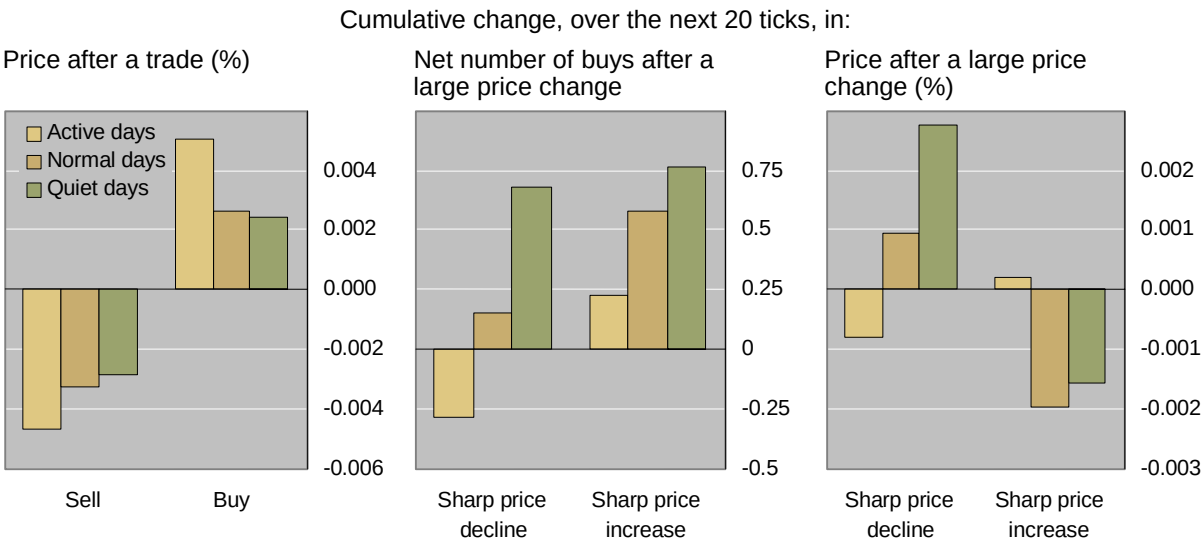
… is stronger on busy trading days

The impact of trades on prices is clearly stronger during days when price changes and trading were unusually active than it is on other days (Graph 2, left-hand panel). On an active day, a new sell order is followed by a cumulative decline in the prevailing price quote averaging 0.0047% over the next 20 ticks, which in this case represents a period of about 13 minutes. A new buy order leads to a price increase of about 0.0050% on active days. The impact of both buys and sells is much smaller during normal days, and even less on quiet days.

[5] This return includes any change in the price that is simultaneous with the trade itself, as do the other 20-tick returns cited in this note. Because of an on-screen "workup" process that allows negotiation on the amount to be traded, it is sometimes possible for GovPX users to be aware that a trade is about to happen a few seconds before it is actually recorded.

Interactions of trades and price quotes in the two-year US Treasury note

January 1999 – December 2000



Note: Each observation ("tick") is either a change in the prevailing quote, a trade, or both. Each price is the midpoint between the prevailing bid and ask quotes on the GovPX system. A "sell" is a seller-initiated trade; a "buy" is buyer-initiated. "Active days" are the 50 days in the sample period when the time between ticks (adjusted for trends and seasonal factors) is at its shortest. "Quiet days" are the 50 days when this time gap is at its longest. A "sharp price decline" is a change in the prevailing quote that is in the lowest 5% of quote changes in the sample. A "sharp price increase" is a change in the prevailing quote that is in the top 5% of quote changes. The "net number of buys" is the difference between buys and sells.

Sources: GovPX, Inc.; authors' calculations. Graph 2

But price changes trigger further buying and selling ...

We also find, however, that price movements themselves sometimes trigger further buying and selling activity, with price increases leading to an increase in buys and decreases leading to an increase in sells (Graph 2, centre panel). This can be seen by comparing trading behaviour following "sharp price declines", defined as the 5% of ticks when the price fell the furthest, with trading behaviour following "sharp price increases", the 5% of ticks when the price rose the furthest.[6] On normal days, there are on average 0.58 more buys than sells in the 20 ticks following a sharp price increase. Following a sharp price decline on such days, buys exceed sells by only 0.15. This effect is exacerbated on active days, while on quiet days it disappears. A sharp price decline on an active day tends to be followed by 0.28 more sells than buys, while a price increase is followed by 0.23 more buys than sells.[7] On quiet days, there is little difference between trading behaviour following price declines and that following price increases.

... especially on more active days

When the price and return effects described so far are considered in tandem, they suggest that price movements should exhibit a certain degree of

[6] Sharp price declines averaged –0.0079%, while sharp price increases averaged +0.0080%; for comparison, the standard deviation of price changes during a single tick was 0.0045% and the average absolute value of a price change was 0.0028%.

[7] From these statistics and from Graph 2, one might think that there are simply more sells than buys on active days. In fact the net number of buys in an average 20-tick period is about the same on active days (0.42) as on quiet days (0.39); both see fewer net buys than normal days (0.64).

positive feedback at short time horizons on active trading days. A price increase leads to relatively more buying, which in turn leads to further price increases, and so on.

The net result is positive feedback

This does seem to be the case in our data, though the picture is complicated by a statistical quirk. Price changes calculated using successive midpoints of the bid and ask prices in the GovPX data are slightly negatively correlated – that is, a price increase tends to be followed by a decrease and vice versa. This seems to reflect the fact that the data combine price quotes (albeit firm ones, ie those at which dealers are committed to transact) and transaction prices.[8] Because of this anomaly, on both normal trading days and quiet days, sharp price declines are partially reversed by subsequent price increases, and sharp price increases are followed by small price declines (Graph 2, right-hand panel).

On active trading days, however, there is little or no reversal. Given that a small amount of price reversal appears to be built into the data by the above-mentioned statistical anomaly, it could legitimately be concluded that price movements reinforce each other on these days – price increases lead to further increases, and price declines lead to further declines.

Sources of positive feedback trading

As noted above, there are already strong theoretical and empirical grounds to expect order flow to have an impact on price movements in the short run. Our results, however, suggest that price movements also have a short-run effect on order flow.

This may result from changes in risk

Why might we expect price movements to have an impact on trading activity? One factor might be the way in which changes in the value of a position cause changes in the perceived risk attributes of that position. Thus, a trader attempting to replicate an option position in the cash market (a strategy known as portfolio insurance) is obliged to sell an increasing amount of the underlying instrument as its price falls, and to buy an increasing amount as the price rises. Secondly, there are often institutional constraints on the permitted risk profile of a trading desk or a firm. Such constraints could take the form of stop-loss orders, which trigger sales when an asset declines in price, or margin agreements which require that debts be repaid when a position's value falls below a specified amount.

Mechanisms such as these are all the more likely to have an impact on markets to the degree that there is uncertainty about how widespread they are. For example, a trader may be uncertain as to whether an observed volume of selling in a declining market represents a change in valuation on the part of informed traders, or selling by leveraged traders who need to meet margin calls. If there is a reasonable probability that the former is the case, the result

[8] A new trade could be at, above or below the prevailing quoted bid or ask price, though normally it is very close to it. After the trade, the prevailing quotes return. This induces a slight negative autocorrelation as the temporary "price change" is reversed.

will be further selling – thus reinforcing the market's price swing.[9] The key area of market uncertainty in such cases is not the true valuation of the traded asset, but the mix of positions, strategies and constraints faced by market participants. Such uncertainty is likely to be greater at times when prices are moving quickly and traders are scrambling to adjust their positions.

Positive feedback and market functioning

These results suggest that bond markets behave in meaningfully different ways depending on whether market conditions are calm or turbulent. This implies that analysts, market participants and market regulators cannot safely use the experience of calm times as a guide to how market prices will move or how effectively markets will function under specific stress scenarios.

Risk management should account for shifts in market functioning in turbulent times

To the extent that this is the case, it has implications for the assumptions that underlie the ways in which government securities are used to hedge against market and credit risk events. For example, the "haircut" that is applied to the securities provided under a collateral agreement would need to be adjusted to account for the fact that markets are likely to be especially turbulent and one-sided at precisely those times when asset prices are moving sharply and more collateral may need to be provided or disposed of. Similar considerations would be relevant to the calculation of margin requirements for positions taken in organised derivatives exchanges.

A broader implication is that trading and risk management rules that may seem effective from the point of view of an individual trader can potentially have disruptive market-wide effects when put into practice by a significant fraction of market participants. Greater transparency about the strategies and assumptions that underlie the behaviour of important market participants can help to reduce these unintended effects, but a degree of uncertainty of this kind will always be present in some form in traded markets.

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Recent initiatives by Basel-based committees and the Financial Stability Forum

Basel Committee on Banking Supervision (BCBS)

In January, the BCBS issued an updated and expanded version of its paper *The relationship between banking supervisors and banks' external auditors*, jointly developed with the International Auditing Practices Committee (IAPC) of the International Federation of Accountants.[1]

The BCBS and IAPC look at the relationship between bank auditors and supervisors ...

The purpose of the paper is to provide information and guidance on how the relationship between bank auditors and supervisors can be strengthened to their mutual advantage, taking into account the Basel Committee's *Core Principles for Effective Banking Supervision*. Specifically, the paper describes the primary responsibilities of the board of directors and management, examines the essential features of the role of external auditors and supervisors, reviews the relationship between external auditors and bank supervisors, and describes additional ways in which auditors can contribute to the supervisory process.

... with a view to fostering coordination between the two groups

The BCBS and the IAPC share the view that a greater understanding among banking supervisors and external auditors of their respective tasks and responsibilities and, where appropriate, more communication between them will improve the effectiveness of bank audits and supervision, to the benefit of the public at large. Both committees recognise that, because the nature of the relationship between auditors and bank supervisors varies significantly from country to country, the guidance may not be applicable in its entirety to all countries. Nonetheless, it will provide a useful clarification of the respective roles of the two professions in the many countries where significant working relationships exist or where the relationship is currently under study.

Also in January, the BCBS made public a paper providing an overview of the individual loss event data collected as part of the second data collection exercise conducted under the Quantitative Impact Study (QIS) on operational

[1] The IAPC is issuing the paper as an International Auditing Practice Statement. Such statements are issued by the IAPC to provide practical assistance to auditors in implementing the International Standards on Auditing or to promote good practice.

The BCBS describes the data collected under its QIS ...

risk (QIS2-Tranche 2).[2,3] The goal of this overview is to illustrate the nature of the data collected, to provide some insight into the types of issues that can (and cannot) be addressed with the data, and to suggest some areas of further refinement for any future QIS data collection exercises. To that end, the final section of the paper reports on some "lessons learned" through the QIS exercises. The purpose of this section is to stimulate discussion with the banking industry and other interested parties that could help identify possible improvements.

... and releases a report on the supervisory guidance of weak banks

In March, the BCBS published a report providing supervisory guidance on dealing with weak banks.[4] The report offers practical help in the areas of problem identification, corrective action, resolution techniques and exit strategies. It notes that supervisors should be sufficiently prepared to deal with a range of contingencies. In a crisis, time is short and problems need to be dealt with as quickly as possible. Delays can aggravate the situation and make solutions more costly. Supervisors should understand the issues and the options for handling weak banks. They should also know with whom to communicate in other organisations and countries when the need arises.

Supervisors need to be discriminating. They have to distinguish between the symptoms and the underlying causes of bank weakness, which will influence their choice of corrective action. While supervisors have to allow for special factors at state banks and international conglomerates, this does not imply forbearance or leniency. They also have to be proportionate and flexible in their use of available tools, judging when a remedial programme is more appropriate than penalties and when (and when not) to publicise restrictions.

The report makes clear that banks can and do fail and that the public should be aware of this. Liquidation is often the right solution but before such a measure is taken there are a number of proven resolution and exit techniques which can minimise disruptions to the financial system. Public bailouts are a last resort.

Committee on the Global Financial System (CGFS)

The CGFS publishes a paper on the implications of innovation in IT

In February, the CGFS published a paper discussing the implications for the financial system of innovations in information technology (IT).[5] It notes that IT has fundamentally changed the way economic activity is carried out and organised. The eventual macroeconomic outcome of these changes and the

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[2] See *The quantitative impact study for operational risk: overview of individual loss data and lessons learned*, BCBS, Basel, January 2002. Available at www.bis.org.

[3] The paper focuses on describing the range of individual loss data submitted by the banks participating in the survey, understanding the range of individual gross loss amounts contained in the data sample and examining information provided on insurance and other recoveries associated with loss events.

[4] See *Supervisory guidance on dealing with weak banks*, BCBS, Basel, March 2002. Available at www.bis.org.

[5] See *IT innovations and financing patterns: implications for the financial system*, CGFS, Basel, February 2002. Available at www.bis.org.

profile of an IT-based economy are still uncertain. Nevertheless, evidence of structural changes in different countries is abundantly available at the microeconomic level, with implications for firms' financial structure and the character of financial intermediation.

The report emphasises that IT-related changes in business models and in the competitive environment may alter the risk-return profile of firms quickly and in an unpredictable way. Such an outcome increases the need for capital that bears business risk, namely equity and financial contracts that incorporate equity characteristics.

The risks lie in the failure of large projects

The main risks involved in the financing of new technologies are large-scale failures of investment projects that may damage the financial institutions providing funding, and excessive price movements in financial markets resulting from unrealistic expectations. Against this background, the report reaffirms that the task of financial policy is to set a framework of standards and guidelines that allows for market-driven adjustment of financing mechanisms and encourages ongoing improvement in risk management techniques.

The report also notes that central banks can play an active role in this process. One aspect of this role is employing the research capabilities and knowledge of the financial system found in central banks to improve understanding of the financial impact of technological change. The other aspect is active monitoring of the financial system. Changing linkages between the real and the financial sphere and across the different segments of the financial system, and, in particular, the reallocation of risks across the financial system underline the need for systemic monitoring.

Financial Stability Forum (FSF)

The FSF calls for vigilance over financial imbalances

The FSF met on 25–26 March in Hong Kong SAR.[6] Participants at the meeting noted that core financial systems had been seriously put to the test but that they had displayed considerable resilience. However, members agreed that the possible interaction of only a mild recovery in global activity with continued financial imbalances called for ongoing vigilance and supervisory cooperation.

The FSF discussed possible financial stability issues arising from recent large corporate failures, noting the widespread relevance of these issues to many countries and the potential repercussions for market integrity. At the suggestion of its G7 members, the FSF Chairman submitted a report on the work taken forward to G7 Ministers and Governors, and the FSF itself will discuss the matter further in Toronto in September 2002.

The FSF also discussed progress in efforts to combat the financing of terrorism. Members took note of the important work currently being carried out by national authorities, the Financial Action Task Force (FATF), the IMF and World Bank and standard-setting bodies, which should strengthen the fight against terrorism financing. The FSF will provide a report to the G7 and G20 on these efforts. FSF members urged all non-FATF members that have not

[6] For information on the FSF, its membership and its activities, readers are invited to visit the FSF website at www.fsforum.org

already done so to conduct a self-assessment of their compliance with the FATF's Special Recommendations on Terrorism Financing by 1 May 2002.

In reviewing progress by offshore financial centres (OFCs) in strengthening their supervisory, regulatory, information sharing and cooperation practices, FSF members underscored the heightened importance for all jurisdictions, including OFCs, of enhancing their implementation of international standards to strengthen the international financial system. FSF members recalled that the FSF classification of OFCs issued in May 2000 aimed at encouraging OFCs to implement international standards and helping the IMF in setting priorities for assessments. Such assessments have been completed in a number of OFCs and are under way in many others. Good progress by some OFCs in improving their implementation of international standards was generally seen by FSF members on many fronts. Others, however, were lagging behind. The FSF will regularly consider progress by OFCs, drawing on supervisory experience gathered through contact meetings and periodic updates by the IMF. On the basis of these considerations, the FSF will draw public attention to those OFCs that give cause for serious concern, while it may also point out positive developments by OFCs as a model for others.

FSF sees progress by some OFCs

The FSF also discussed how far previous concerns relating to highly leveraged institutions (HLIs) had been allayed by the implementation of its March 2000 recommendations, taking account of changes within the industry and market environment. It was noted that improved counterparty risk management, strengthened regulatory oversight of hedge fund counterparties and gains in information flows had contributed to reducing leverage. These developments had lessened the risks that hedge funds could pose for the international financial system. However, the FSF warned against complacency and urged continued improvements in public disclosures by hedge funds to strengthen market discipline and reduce systemic risk.

Moreover, the FSF reviewed operational issues arising in financial markets in the context of 11 September 2001 and lessons being drawn with regard to contingency arrangements. The FSF will consider these issues in more depth at its next meeting. It also welcomed the development of a Crisis Management Contact List to facilitate crisis management. The list covers central banks, supervisory/regulatory agencies, finance or treasury departments and key international financial institutions as well as global service providers in some 30 countries. Lastly, it agreed that the Recommendations for securities settlement systems, prepared by the CPSS and IOSCO, and the FATF's Special Recommendations on Terrorism Financing, would be included in the key standards highlighted by the FSF for sound financial systems.

Crisis Management Contact List drawn up