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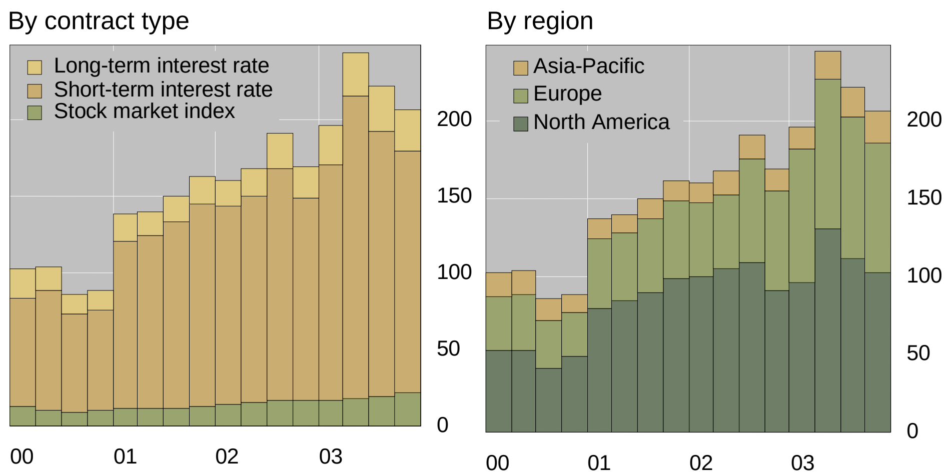
4. Derivatives markets

The aggregate turnover of exchange-traded financial derivatives contracts monitored regularly by the BIS shrank further in the fourth quarter of 2003. The combined value of trading in interest rate, stock index and currency contracts amounted to $207 trillion, a 7% decline from the third quarter (Graph 4.1). Activity was uneven across the major market risk groups, with turnover in interest rate contracts falling substantially and that in stock index and currency contracts growing at a moderate pace. The overall decline in the turnover of interest rate instruments, the largest of the broad market risk categories, resulted from a drop in both money market and government bond contracts.

Nonetheless, for 2003 as a whole the aggregate value of turnover in financial contracts rose considerably. Transactions during the year reached $874 trillion (see the box on page 44). This represented a 26% increase, which compares with increases of 55% and 17% in 2001 and 2002 respectively. Business was brisk in all of the broad market risk categories. Activity in the small market for currency contracts was particularly buoyant after a long period of stagnation.

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

Fixed income contracts slow down in calmer markets

Activity in fixed income contracts declines ...

Aggregate trading in exchange-traded interest rate contracts declined in the fourth quarter of 2003. The volume of transactions fell by 9% to $184.5 trillion, compared with a decline of 10% in the third quarter. This overall slowdown in fixed income business resulted from a drop in the two major market segments, namely money market and government bond contracts. Turnover in short-term interest rate contracts, including eurodollar, Euribor and euroyen, fell by 9% to $157.7 trillion, while business in longer-term instruments, including US Treasury notes, German government bonds and Japanese government bonds, weakened by 10% to $26.7 trillion (Graph 4.3).

... across most regions ...

Trading in fixed income contracts declined across most geographical regions. In North America, business weakened by 9% to $93.7 trillion. Money market contracts fell by 8% to $84.7 trillion and longer-term instruments by 15% to $9 trillion. In contrast to earlier quarters in 2003, there was little difference in the behaviour of the various money market and government bond contracts or in that of futures and options.

... reflecting calmer US markets ...

Aside from the seasonal slowdown often observed in the last part of the year, the overall reduction in US money market and longer-term activity reflected two main factors. First, US fixed income markets returned to a measure of calm in the fourth quarter following the abrupt spike in the yields on Treasuries and dollar-denominated interest rate swaps between mid-June and mid-August. The US Federal Reserve Open Market Committee's statements in October and December acknowledged an improvement in the economic outlook but also implied that monetary policy would continue to be accommodative for a considerable period of time. Although US Treasury yields faced bouts of upward pressure during the course of the quarter, market participants interpreted the Federal Reserve's statements as an indication that it would not increase policy rates. Such an interpretation would be consistent with the observed reduction in the implied volatility of eurodollar rates (Graph 4.2) and less active position-taking in related contracts.

... and perhaps the persistence of risk aversion

Second, position-taking may have been hampered by the persistence of risk aversion in the US government bond market in the wake of the market's wide swings in the summer. The spread between implied and realised volatility of options on US government bonds (Graph 4.2) remained unusually wide in the fourth quarter, reflecting the high price charged by intermediaries for market risk. Some dealers were reported to have made significant losses in their market-making and proprietary trading activities in the third quarter, which may have led to a retreat from market-making in the fourth.

In Europe, fixed income business contracted by 9% to $79.5 trillion in the fourth quarter. Transactions on money market rates dropped by 9% to $64.1 trillion, while trades in longer-term instruments fell by 8% to $15.3 trillion.[1] The lower volume of activity in European money market

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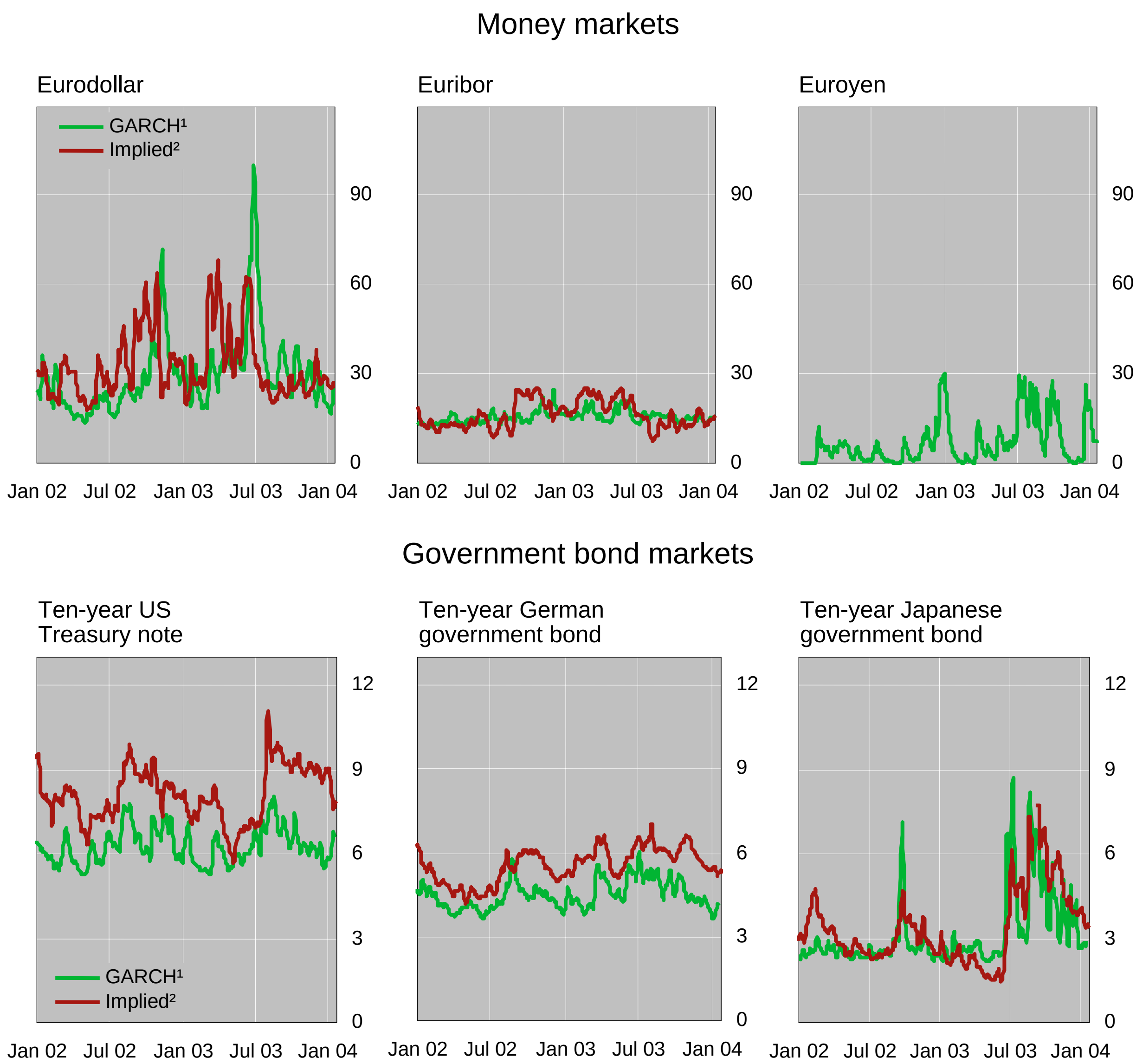
[1] It should be noted, however, that the decline in European fixed income activity in US dollar terms represents an "underestimate" of the underlying reduction in business, since the 6% increase in the average value of the euro relative to the US dollar between the third and fourth

Volatility of major fixed income rates

Five-day moving averages



[1] Annualised conditional volatility of daily changes in bond yields from a GARCH(1,1) model. [2] Volatility implied by the prices of at-the-money call options.

Sources: Bloomberg; national data; BIS calculations. Graph 4.2

European business slows with consensus on rates

contracts was almost entirely accounted for by a decline in the trading of options on three-month Euribor futures. The expected path of three-month rates implied by Euribor futures with delivery dates in 2004 rose substantially during the fourth quarter. Even so, market participants seemed to display a high degree of agreement concerning the near-term evolution of short-term rates, as illustrated by the low volatility of options on three-month Euribor rates (Graph 4.2). The slowdown of business in European government bond

quarters inflated the dollar value of transactions. An analysis of European transactions in terms of the number of contracts traded shows a 13% reduction in actual turnover.

Exchange-traded markets remain buoyant in 2003

Trading in exchange-traded financial derivatives contracts monitored by the BIS continued to grow rapidly in 2003, with turnover expanding by 26% to $874 trillion. This compares with increases of 17% in 2002 and 55% in 2001. Business in 2003 was brisk in all of the broad market risk categories. Money market contracts accounted for most of the increase in trading in dollar terms but activity in the small market for currency contracts grew at the most rapid pace.

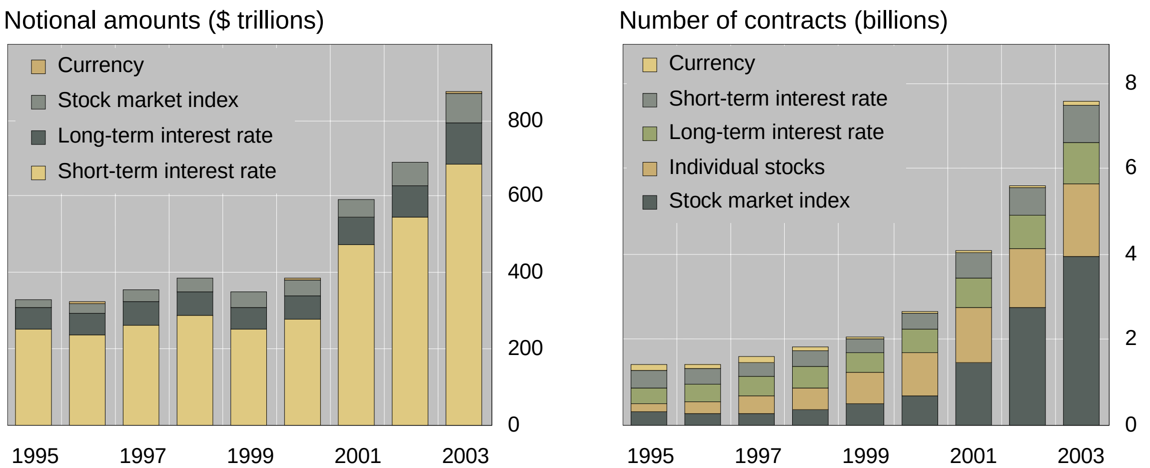
European fixed income business benefits from deepening liquidity

Worldwide trading in fixed income contracts, the largest segment of exchange-traded markets, rose by 27% to $794 trillion. Money market contracts, including futures and options on eurodollar, Euribor and euroyen rates, accounted for the biggest increase in activity in dollar terms, rising by $137 billion, or 25%, to $683 trillion. However, longer-term contracts, largely on government bonds, expanded at a faster pace, up by 41% to $111 trillion.

One of the most notable developments in the area of money market products was the particularly strong expansion of activity on European exchanges. European trading of such instruments, principally on Euribor, jumped by 64% to $278 trillion, compared with an increase of 7% in North America to $369 trillion. Trading in options on European money market rates was particularly buoyant, up by 111% to $83 trillion compared with an increase in futures of 50% to $195 trillion. Trading in European money market instruments has been catching up rapidly with that in North America since 2002. Changing expectations about the stance of monetary policy in the euro zone played a role in the expansion of the short-term segment but activity also appears to have been boosted by a deepening of liquidity in over-the-counter (OTC) derivative instruments indexed to Euribor. In particular, the euro-denominated interest rate swap market continued to grow vigorously in 2003, generating a flow of secondary hedging transactions in Euribor futures. The notably strong increase in exchange-traded options may have resulted from a shift of business away from the OTC derivatives market. Volatility in several types of option products traded in the OTC market, including interest rate swaptions, reached unusually high levels in the second half of 2003. This may have prompted some market participants to switch to exchange-traded instruments.

Activity in longer-term fixed income instruments was also more buoyant on European exchanges than in other major geographical areas. European business in such contracts rose by 49% to $66 trillion, compared with an increase of 36% to $36 trillion in North America. As was the case for European trading in short-term rate contracts, European business in options on government bonds was especially active. Trading in such options rose by 86% to $5.6 trillion compared with an increase in futures of 46% to $60 trillion. Trading in government bond contracts in Europe and North America was fuelled by sharp swings in long-term interest rates in the first three

Turnover of exchange-traded financial derivatives contracts by broad market risk category



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

quarters of 2003. The rally in fixed income markets in the first half of the year and its subsequent reversal from the end of June created a heavy volume of rebalancing transactions. Financial institutions, in particular, actively use fixed income futures and options to adjust the duration of their assets and liabilities as the level of interest rates changes. Such "immunisation" strategies create a positive link between transactions and market movements.

By comparison, fixed income activity in the relatively smaller marketplaces of the Asia-Pacific region was somewhat subdued. Trading in money market contracts grew by 8% to $32 trillion, while transactions in government bond contracts rose by 12% to $9 trillion. Trading in Australia was the main exception to this pattern of moderate growth, with transactions on short-term rates and government bonds together rising by 59% to almost $10 trillion. This sharp increase seems to have been related to the hedging of new issuance in the corporate bond market and a readjustment of positions in the wake of the Reserve Bank of Australia's increases of its cash target rate in November and December.

Stock index business driven by Asian activity

Global activity in stock index contracts rose by 20% to $75.5 trillion. Business expanded at widely differing rates across the major geographical areas. Turnover in the Asia-Pacific region rose by 48% to $27.8 trillion and that in Europe by 19% to $14.7 trillion. The notable increase in activity in Asia was once again largely attributable to robust trading in options on the Korea Stock Exchange's KOSPI 200 index, with a rise in turnover of such instruments of 49% to $21 trillion. Options trading in Korea was introduced in 1997 but has expanded exponentially in recent years. Meanwhile, business in Japanese stock index contracts rose by 40% to $3 trillion, a tentative recovery following the stagnation observed in recent years. By contrast, activity in North America was much weaker, with transactions growing by 4% to $32.3 trillion. The upward movement of US equity markets from March onwards was accompanied by significantly lower volatility, realised and implied, which may have acted to weaken investor demand for protection.

Contracts on individual stocks, for which turnover is measured only in terms of the number of contracts, also expanded by 20% in 2003 to 1.7 billion. Business on North American exchanges rose by 17% to 837 million contracts, while that on European exchanges grew by 8% to 592 million. Trading in the Asia-Pacific region jumped by 112% to 43 million contracts, largely because of the introduction of trading in options in India. Activity in the rest of the world received a boost from a 96% increase in futures and options in Brazil to 176 million.

Currency contracts recover on dollar weakness

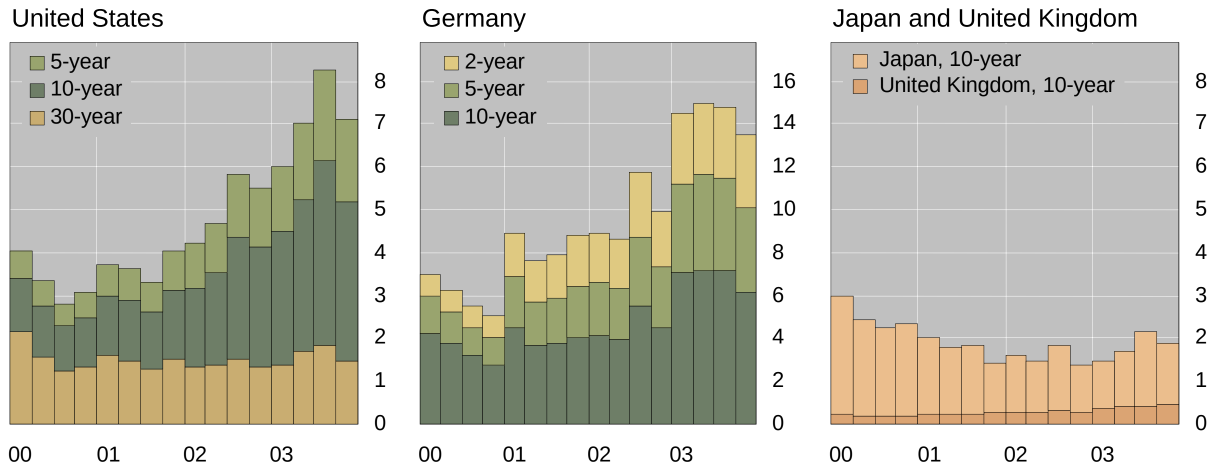
Exchange-traded currency contracts, which account for less than 1% of overall turnover in financial instruments, grew by 51% to $4.4 trillion in 2003. Such contracts appear to have been recovering in recent years from a long period of stagnation. This recovery stems largely from a significant increase in the turnover of dollar/euro futures on the Chicago Mercantile Exchange (CME), the largest marketplace in the world for exchange-traded currency contracts. Trading in such contracts was boosted by protection-seeking as the dollar depreciated sharply in the foreign exchange market. Trading in dollar/yen futures also rose notably, fuelled by the G7 countries' call in September for more exchange rate flexibility. Market participants noted that the introduction by the CME of round-the-clock electronic trading for its currency contracts in April 2001 had helped enlarge the pool of traders in such instruments. Electronic trading may enable exchanges to compete more effectively with the much larger OTC market for currency instruments.

Commodity contracts grow with the rise of commodity prices

Business in commodity contracts, as measured by the number of contracts traded, also expanded in 2003. Overall, turnover rose by 10% to 530 million contracts. Trading in contracts on precious and non-precious metals, which together account for one third of total turnover in commodity contracts, was particularly brisk, up by 26% and 30% respectively. Activity in contracts on non-precious metals appears to have been fuelled by stronger expectations of a pickup in global economic activity. Transactions in contracts on precious metals, especially gold, mirrored to some extent the movements of the dollar, playing the role of safe asset when the slide in the US currency accelerated. By comparison, business in agricultural commodities and energy products was lacklustre, with turnover rising by 4% and 2% respectively.

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

contracts resulted largely from weaker activity in both futures and options on 10-year German government bonds, probably owing to reduced uncertainty in longer-term markets.

Drop in interest rate activity in Asia-Pacific ...

Trading in interest rate products in the Asia-Pacific region dropped by 11% to \$10.3 trillion. There was a sharp contrast between the pattern of activity in Japan and Singapore, the two largest marketplaces for fixed income products in Asia, and that in Australia, which is the third most important centre. Business in Japan and Singapore contracted by 19% and 18% respectively, while that in Australia expanded by 15%. The lower volume of activity observed in Japan reflected calmer market conditions following the burst of speculative trading in the previous quarter (see the December 2003 issue of the *BIS Quarterly Review*). The slowdown observed in Singapore resulted largely from weaker activity in eurodollar contracts traded on that marketplace as traders anticipated steady US short-term rates. The buoyancy of turnover in Australia reflected a number of factors. First, the Reserve Bank of Australia's increase of its cash target rate in early November occurred slightly sooner than market participants had expected, leading to some readjustment of positions in the money and government bond markets. Second, government bond contracts were actively used by intermediaries to hedge a steady flow of corporate bond issues. Third, foreign investors demonstrated a strong appetite for bonds denominated in Australian dollars, possibly using government bond futures to fix the purchase price of securities ahead of their planned acquisition.

... except in Australia, where business rises sharply

Equity contracts expand despite falling volatility

Equity index derivatives grow ...

Trading in stock index contracts gained strength in the fourth quarter of last year. Turnover rose to \$21.8 trillion, a 13% increase over the previous period. Growth was stronger for options than for futures, 19% against 7%, with

... more in Asia and in Europe ...

turnover reaching $12.8 trillion and $9.0 trillion respectively.[2] The growth in activity was substantially higher in Asia, up by 26% to $9 trillion, and in Europe, up by 10% to $4 trillion.[3] The buoyancy of trading in Asia reflected almost entirely a further increase in the turnover of options on the KOSPI 200 index traded on the Korea Stock Exchange. In Europe, business grew particularly rapidly on German exchanges, where trading expanded by 14%. Much of the increase was accounted for by contracts on the Dow Jones EURO STOXX 50 and the Dow Jones STOXX 50 indices. Activity in such indices seems to have been supported by concerns that the depreciation of the dollar could have adverse effects on the profitability of European export-oriented firms.

... than in the United States ...

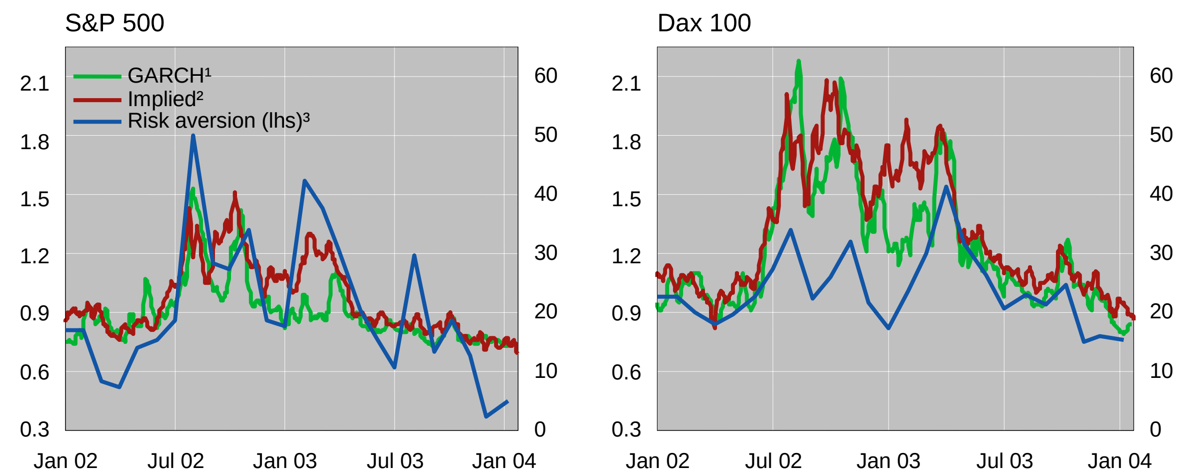
Derivatives business grew at a comparatively slower pace in North America, with transactions on US exchanges expanding by 3% to $8 trillion. The rise in activity on US marketplaces derived almost entirely from options on the S&P 500 index traded on the Chicago Board Options Exchange (CBOE).

... despite lower volatility

This increase in global activity was somewhat surprising given that it coincided with a further decline in market uncertainty. Implied and realised volatilities continued to fall from the peaks reached in 2002 (Graph 4.4), a development that should have limited the demand for insurance against market

Volatility of major equity markets

Five-day moving averages



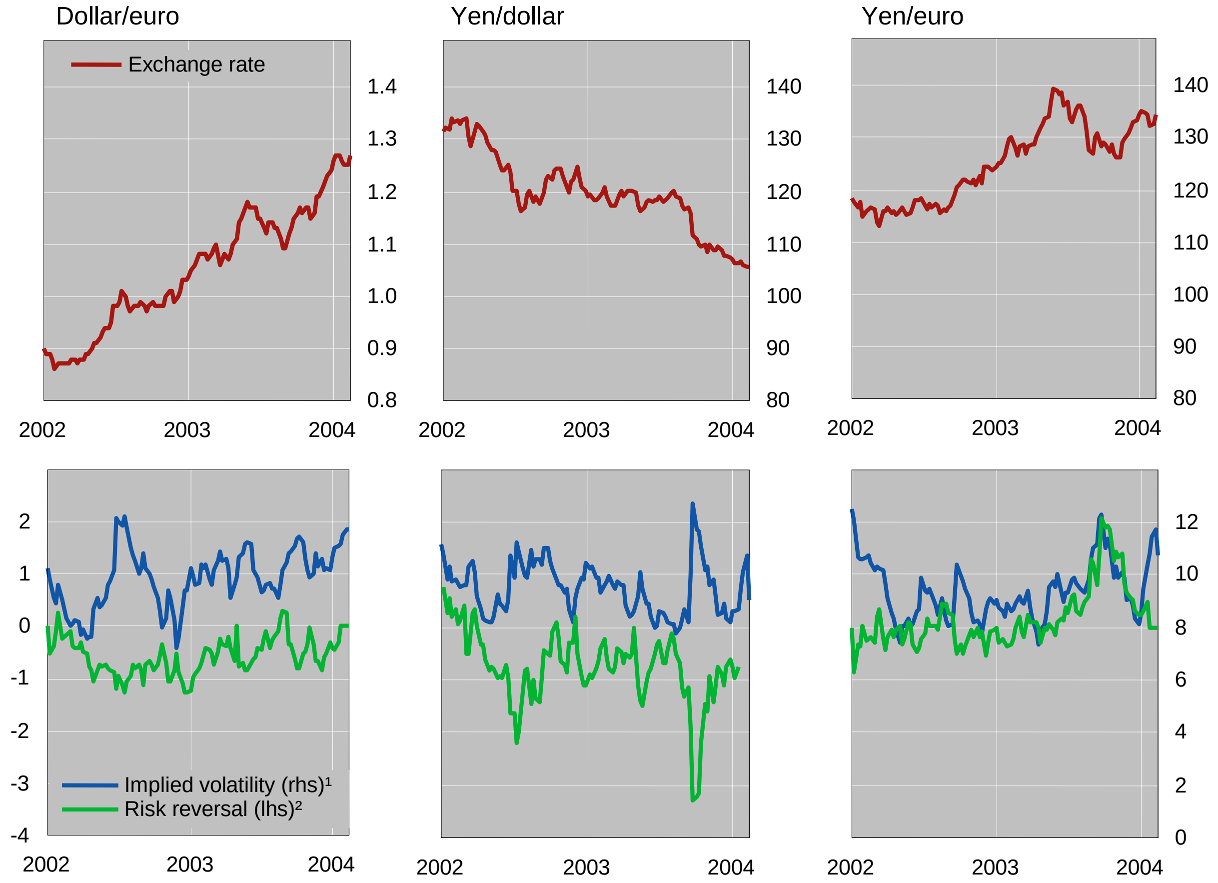
[1] Annualised conditional volatility of daily stock returns from a GARCH(1,1) model. [2] Volatility implied by the prices of at-the-money call options. [3] Monthly calculation (interpolated).

Sources: Bloomberg; national data; BIS calculations. Graph 4.4

[2] When changes are calculated over the corresponding quarter of the preceding year, thereby controlling for the presence of seasonal factors, the rise in stock index derivatives trading in the last quarter of 2003 is even larger, with turnover expanding by 28%, for both futures and options.

[3] The growth in the dollar value of European activity resulted largely from a 6% increase in the average value of the euro relative to the US dollar between the third and fourth quarters of 2003. Exchange rate effects worked in the other direction in Asia, where the dollar value of trading in Korean contracts was weakened by a 4% depreciation of the Korean won against the dollar.

Exchange rates, implied volatilities and risk reversals



[1] One-month horizon, in percentages. [2] A positive value indicates a bias towards dollar strength in the left-hand and centre panels, and towards euro strength in the right-hand panel.

Sources: DrKW Research; Reuters; BIS calculations. Graph 4.5

risk offered by options. At the same time, however, other factors may have induced a shift in the cost of protection against downside risk. Among these factors, the market price of risk, as measured by the coefficient of risk aversion calculated from stock index options, has followed a downward trend since mid-2002 (see the Overview).

... and wider disagreement about future growth

The higher volume of trading could perhaps be explained by an unusual degree of disagreement between agents about the strength of the global economic recovery. Asset trading naturally arises when economic agents entertain divergent opinions about the evolution of fundamental variables. This appears to have been the case since March 2003, with analysts surveyed by Consensus Economics showing increasingly diverging views about expected GDP growth in the United States and Europe in 2004. For the United States, their forecasts ranged from 3.7 to 5.1% in November, compared to a range of 3.3–4.4% in September.

Along with derivatives on stock indices, contracts on individual equities also expanded in the fourth quarter, with turnover, measured by the number of contracts, growing by 7%. Options account for 97% of turnover, and over half of these are traded on US exchanges. Global activity in such contracts remains concentrated on the International Securities Exchange and the CBOE. In the fourth quarter the use of these instruments grew sharply in the United States, by nearly 20%, and also in Asia, although activity slowed down almost everywhere in Europe, notably in France and Germany.

Dollar weakness boosts currency contracts

Currency futures expand ...

The turnover of exchange-traded currency derivatives, whose value represents only a small fraction of exchange-traded financial derivatives surveyed by the BIS, reached a notional amount of $1.2 trillion in the last quarter of 2003, a 9% increase. The rise in activity stemmed almost entirely from futures, for which turnover expanded by 10% to $1.1 trillion. Trading of currency derivatives remains concentrated on US-based exchanges, which account for nearly 90% of global turnover.

... on expectations of a weakening dollar

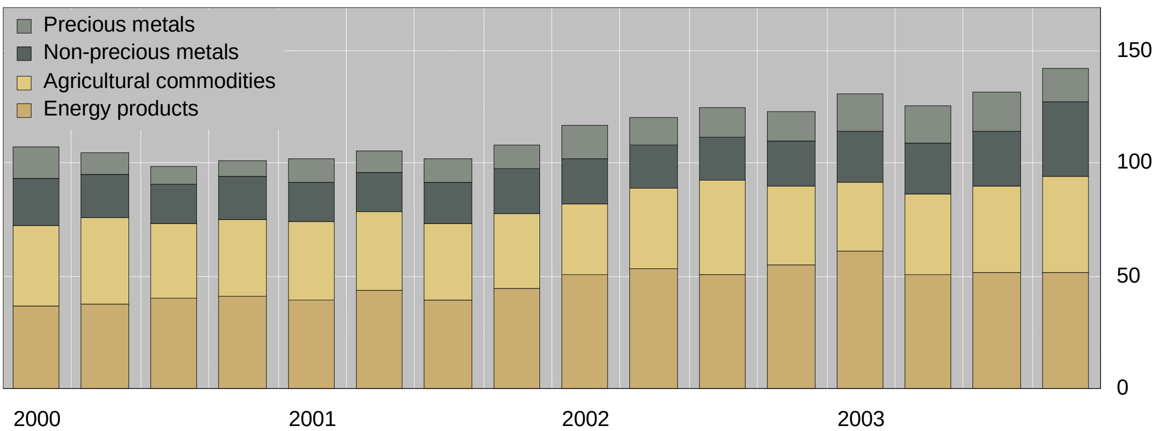
Activity seems to have been influenced recently by the movements of the dollar, with futures growing particularly sharply in December, when the US currency slid below the $1.2 threshold against the euro. The increase was fuelled by customers seeking protection against persistent expectations of dollar depreciation, against both the euro and the yen, as illustrated by the risk reversal indicator implicit in currency options prices (Graph 4.5).

Global recovery and flight to safety drive commodity contracts

The turnover of derivatives on commodities, measured by the number of contracts traded, expanded by 8% in the last quarter of 2003. Trading was particularly brisk for non-precious metals, which grew by 36% (Graph 4.6). Activity in these derivatives, mostly represented by futures, was driven by positive revisions to expected GDP growth in most areas of the world.

Turnover of exchange-traded commodity contracts by underlying type of commodity

Number of contracts (millions)



Sources: FOW TRADEdata; Futures Industry Association; BIS calculations. Graph 4.6

Activity in derivatives on precious metals declined by almost 20% during the most recent review period. However, open interest in such contracts, which measures positions opened but not yet closed, rose by 57% between the end of 2002 and the end of the third quarter of 2003. This suggests that precious metals may have played the role of safe assets in a period characterised by marked dollar weakness. Open interest subsequently returned to the levels prevailing in late 2002, probably because the remarkable increase in the price of gold led many investors to take profits by either exercising their options or closing their futures positions.

Gold seen as a safe asset