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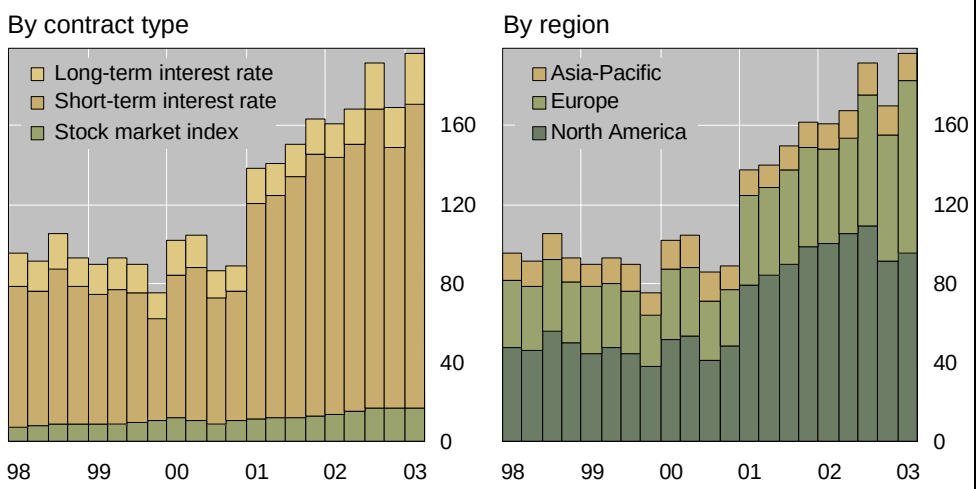
4. Derivatives markets

The aggregate turnover of exchange-traded financial derivatives contracts monitored by the BIS rebounded in the first quarter of 2003. The combined value of trading in interest rate, stock index and currency contracts increased by 16% to $197 trillion (Graph 4.1). Activity was uneven across the major market risk groups, with turnover in fixed income contracts rising appreciably and business in stock index contracts declining marginally. Trading in European fixed income products was exceptionally buoyant. Exchanges continued to introduce a variety of new contracts, including futures on euro overnight index average (EONIA) rates (see the box on page 34).

The latest BIS semiannual data on aggregate positions in global over-the-counter (OTC) derivatives markets show a remarkable rise in gross market values in the second half of 2002 (Graph 4.5 and Table 4.1). Values rose by 43% and stood at $6.4 trillion at the end of the year. Interest rate swaps accounted for the bulk of the increase, which evidently resulted from the sharp drop in swap yields over the review period (see the Overview). Market participants paying fixed interest on swap contracts would have suffered losses, probably leading some of them to reverse their positions through the writing of new swaps. Such unwinding activity is suggested by the rapid growth

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

in the notional amounts of swap contracts during the period. For OTC markets as a whole, the notional amount of contracts rose by 11% to $142 trillion.

The new OTC numbers also show that, in contrast to 2001, OTC business accelerated relative to that on exchanges in 2002. Further development of measures to reduce counterparty credit risk in OTC markets may have helped to maintain their competitiveness.

Upswing in exchange-traded interest rate contracts

Money market contracts account for much of the upswing ...

Aggregate trading in exchange-traded interest rate contracts, the largest of the broad market risk categories, rebounded strongly in the first quarter of 2003. Transactions expanded by 18% to $179.8 trillion, compared with a decline of 13% in the fourth quarter of last year. Contracts on short-term interest rates, including eurodollar, Euribor and euroyen, accounted for much of the absolute increase in activity, with turnover rising by 17% to $153.8 trillion. However, contracts on government bonds, including 10-year US Treasury notes, 10-year German government bonds and 10-year Japanese government bonds, rose at a more rapid pace, with business up by 29% to $26 trillion (Graph 4.2).

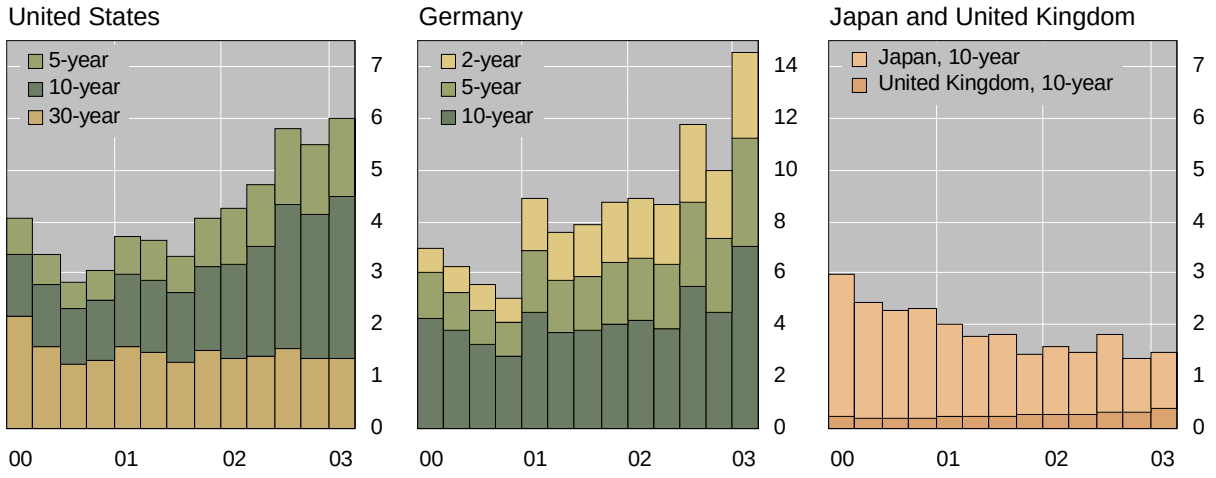
... with a surprisingly strong increase in Europe

The most notable feature of activity in interest rate products was a surprisingly pronounced increase in trading in Europe, where turnover expanded by 37% to $83.7 trillion. Transactions in European money market contracts (largely on Euribor) rose by 35% to $67.1 trillion, while those in European government bond contracts (mainly on German government bonds) were up by 46% to $16.6 trillion. Options on all types of fixed income futures contracts grew by nearly 60%.

Trading in European interest rate contracts proceeded at an uneven pace during the course of the quarter. In January, turnover recovered strongly from its usual seasonal slowdown in December 2002; in February business expanded modestly and in March transactions reached new monthly records.

Turnover in government bond contracts

Quarterly futures contract turnover, in trillions of US dollars

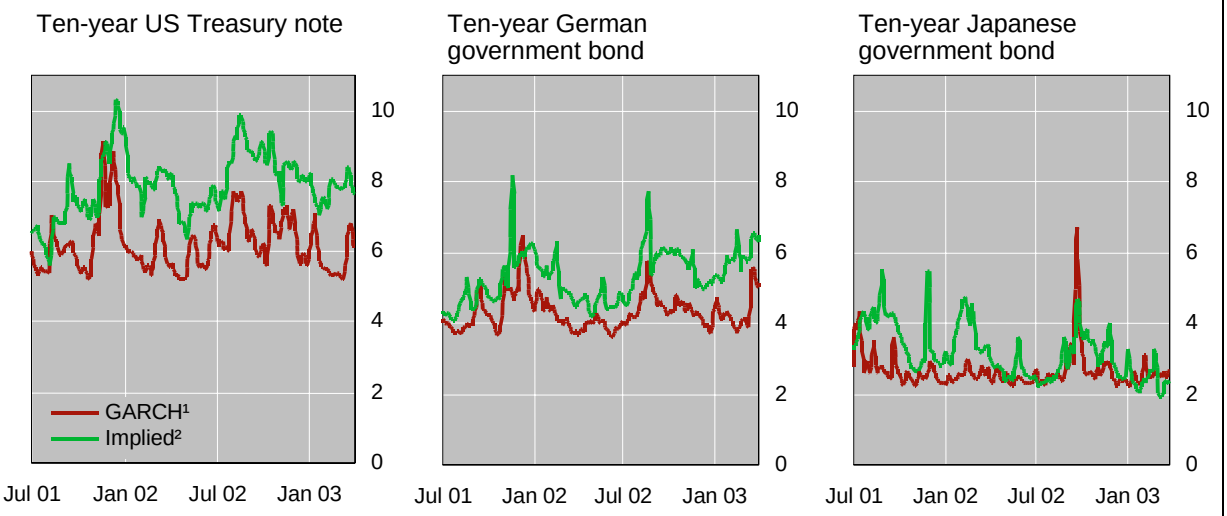


Sources: FOW TRADEdata; Futures Industry Association; BIS calculations.

Graph 4.2

Volatility of major bond markets

Five-day moving averages



[1] Annualised conditional variance 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 4.3

Robust growth in European bond contracts

Various factors could explain the particularly robust increase in German government bond contracts during the review period. First, European equity markets were more volatile than US markets (see the Overview). Investors were reported to have shifted some of their funds from euro area stock markets to euro area government bond markets as stock markets faced repeated bouts of downward pressure. Such investment flows into government bonds may have been associated with increased use of German government bond futures to manage the market risk of the newly acquired securities. Futures may also have been used to fix the price of anticipated purchases of government bonds. Second, as illustrated by the appreciation of the euro, investor sentiment towards euro area financial assets improved considerably during the course of the quarter. Expectations of further declines in ECB policy rates, given the weakness of euro area economies, may have encouraged investors to take additional long positions in German government bond futures in anticipation of their outperformance relative to other major government bond futures markets. Moreover, the lower implied volatility observed in the German bond market compared to that of US bond markets (Graph 4.3) led some investment banks to recommend the taking of long positions in call options on German government bond futures to benefit from their outperformance. Such positioning may have accounted for the particularly strong expansion of interest rate options during the quarter. Third, traders may also have taken advantage of the unusually low yields in the cash market in late February and early March by taking short positions in German government bond futures. Such positions would have generated high returns given that bond market yields rose sharply in the second and third weeks of March.

Modest expansion in North American rate contracts

The increase in the aggregate trading of interest rate products on North American exchanges was comparatively modest. Turnover rose by 5% to

Exchanges introduce new contracts on EONIA rates

The BIS began to follow 117 new contracts in the first quarter of 2003, including 68 stock index and single equity contracts, 30 commodity contracts, 10 currency contracts and nine interest rate contracts.

The introduction of EONIA futures by Eurex in late January and by Euronext.liffe in early February caught the market's attention. The new EONIA futures are based on the monthly average of the reference rate computed daily by the ECB from a panel of banks conducting overnight transactions in the euro-denominated interbank market.[①] The new contracts have a notional size of €3 million and a minimum price movement of 0.005 percentage points. The contracts have monthly maturity dates and several delivery months (nine on Euronext.liffe and 12 on Eurex). They are aimed at financial institutions wanting to conduct a more precise hedging of their very short-term interest rate risks. Overnight interest rates are closely influenced by changing expectations of monetary policy in the euro area. They are also affected by month-end funding pressures, including those resulting from the need for banks to maintain minimum reserve requirements on the 23rd calendar day of each month. EONIA rates have achieved benchmark status in the euro area money market and interest rate swap market since their introduction in early January 1999. Overnight index swaps, which involve an exchange of fixed for floating interest rates with a floating leg tied to daily EONIA rates, have become particularly popular hedging and positioning vehicles.[②] Indeed, the short-dated euro area interest swap market is now based almost exclusively on EONIA as a reference rate.

[①] To be more precise, the EONIA rate is a weighted average of interest rates contracted on unsecured overnight loans in the euro area interbank market. [②] For a more extensive treatment of the development of the euro swap market, see E M Remolona and P D Wooldridge, "The euro swap market", *BIS Quarterly Review*, March 2003, pp 47–56.

$86.8 trillion, with money market contracts up by 5% to $79.1 trillion and government bond contracts up by 8% to $7.7 trillion. US mortgage refinancing reached a new record at the end of the first quarter, which presumably supported transactions aimed at hedging mortgage prepayment risk.

Trading in interest rate products in the Asia-Pacific region rose by 7% to $8.7 trillion. Interest rate business in Singapore, the largest Asian market for such products, rose by 6% to $4.8 trillion, while that in Australia jumped by 43% to $2 trillion. Activity in Japan declined for the second consecutive quarter, by 12% to $1.7 trillion, largely due to a lower turnover of Japanese money market instruments.

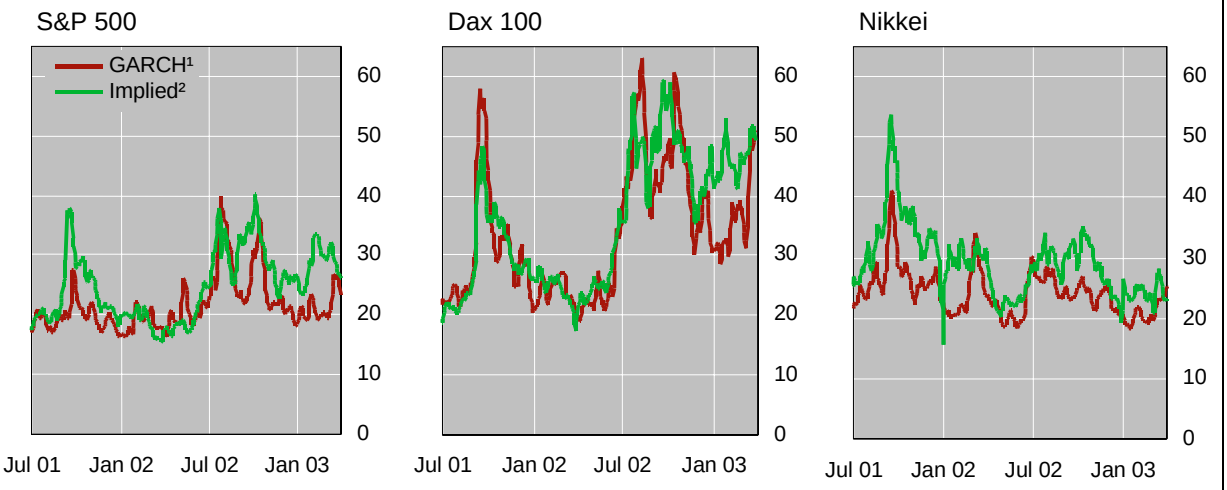
War-related uncertainty hampers stock index contracts

Activity in stock index contracts declined slightly in the first quarter of 2003. The 3% reduction in turnover to $16.7 trillion resulted from a contrasting pattern of trading across regions, with turnover in North America and the Asia-Pacific region dropping by 5% and 9% respectively, and business in Europe expanding by 13%.

The turnover of stock index contracts did not rise significantly when global equity markets faced downward pressure in January and February. This may

Volatility of major equity markets

Five-day moving averages



[1] Annualised conditional variance of daily stock returns 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 4.4

Geopolitical tensions lead to retrenchment

have reflected a retrenchment from risk-taking as rising geopolitical tensions exacerbated market volatility (Graph 4.4) by overshadowing macroeconomic and corporate earnings announcements.[1] Such a pullback would appear to have been in line with weak activity in some underlying cash markets, with investors showing a reluctance to commit funds before a resolution of the situation in the Middle East. However, a rally in stock markets from the second week of March led to a burst of activity across all major regions. Market reversals are often associated with an increased use of stock index futures as new information or revised expectations lead market participants to adjust their positions.

Rise in gross market values fuels activity in global OTC derivatives markets

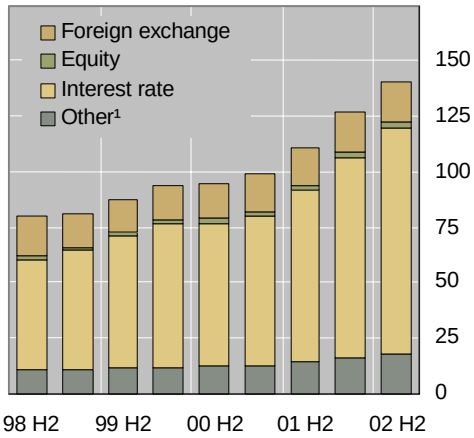
Exceptional rise in gross market values

Data from the semiannual BIS survey on positions in global OTC derivatives markets at the end of December 2002 show that there was an exceptionally sharp increase in gross market values, up by 43% to $6.4 trillion (Graph 4.5). This latest rise brought the overall ratio of gross market values to notional amounts to 4.5%, the highest since the BIS began collecting data on OTC derivatives markets. Although part of the increase resulted from an expansion of notional amounts (see below), it was nevertheless larger than what would have been expected solely from the growth in notional amounts outstanding.

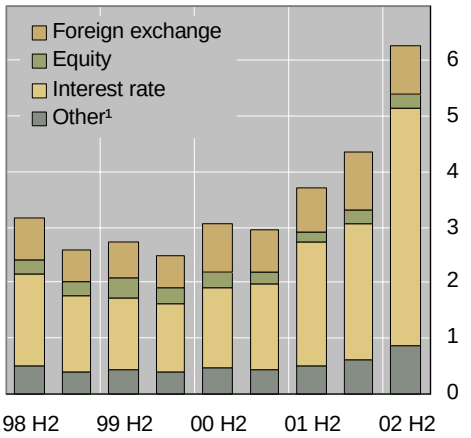
[1] Higher market volatility does not always lead to more active trading in derivatives markets. Indeed, sufficiently high levels of volatility could lead to a retrenchment by information-based traders. Such a retrenchment would offset some of the mechanical increase in hedging-related transactions. See S Jeanneau and M Micu, "Volatility and derivatives turnover: a tenuous relationship", *BIS Quarterly Review*, March 2003, pp 57–65.

Global OTC derivatives

Notional amounts outstanding by broad risk category ($ trillions)



Gross market values by broad risk category ($ trillions)



[1] Estimated positions of non-regular reporting institutions.

Source: BIS. Graph 4.5

Given that much of the rise was accounted for by interest rate products, particularly swaps, it probably reflected the impact of a rally in swap markets between July and early October.

Participants facing losses on swaps ...

Gross market values measure the replacement cost of all outstanding contracts had they been settled on the last day of a given reporting period (31 December 2002 in the most recent survey). As such, they are a more accurate indicator of counterparty credit risk than notional amounts. The gross market value of forward-type contracts, such as swaps, is generally zero at the initiation of the contract. However, subsequent changes in the prices of underlying assets lead to the emergence of symmetric marked to market gains and losses between counterparties. Hence, gross market values tend to reflect changes in the price of financial assets. The downward trend of swap yields over the review period is likely to have generated valuation losses for fixed rate payers, since the lower market rates would have implied lower fixed rate payments on new swaps than on those contracted in earlier periods. In order to cut their losses in forthcoming periods, some market participants may have attempted to reverse their outstanding swap exposures. Such a reversal would have required the writing of new contracts, boosting the stock of outstanding contracts. The increase in gross market values could thus have had a positive feedback effect on the size of the OTC market.

... attempt to reverse their exposures

Indeed, OTC derivatives markets continued to grow rapidly in the second half of 2002, with the total estimated notional amount of outstanding contracts rising by 11% over the end-June 2002 figure, to stand at almost $142 trillion. This compares with a rise of 15% in the previous half-year period. Such a robust expansion is in line with data reported by other market sources.[2]

[2] Data released in their respective market surveys by other sources, such as the International Swaps and Derivatives Association (ISDA) and the US Office of the Comptroller of the Currency (OCC), have confirmed the rapid expansion of the OTC market. ISDA reported a 21% increase in the global stock of OTC contracts in the second half of 2002, while the OCC

OTC derivatives markets driven by interest rate contracts

Market expansion in OTC derivatives continued to be driven by interest rate instruments, the largest of the broad market risk categories (Graph 4.5 and Table 4.1), with outstanding contracts growing by 13%. By contrast, activity in foreign exchange products, the second largest broad market risk category, was subdued, with the stock of contracts expanding by 2%. The pace of activity in equity-linked instruments was also moderate, with a 4% increase in outstanding amounts. Lastly, business in commodity contracts, the smallest of the major groups of instrument, remained strong, with outstanding amounts up by nearly 20%.[3]

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

Amounts outstanding, in billions of US dollars

	Notional amounts				Gross market values			
	End-Jun 2001	End-Dec 2001	End-Jun 2002	End-Dec 2002	End-Jun 2001	End-Dec 2001	End-Jun 2002	End-Dec 2002
Grand total	99,755	111,178	127,564	141,737	3,045	3,788	4,450	6,361
A. Foreign exchange contracts	16,910	16,748	18,075	18,469	773	779	1,052	881
Outright forwards and forex swaps	10,582	10,336	10,427	10,723	395	374	615	468
Currency swaps	3,832	3,942	4,220	4,509	314	335	340	337
Options	2,496	2,470	3,427	3,238	63	70	97	76
B. Interest rate contracts[2]	67,465	77,568	89,995	101,699	1,573	2,210	2,468	4,267
FRAs	6,537	7,737	9,146	8,792	15	19	19	22
Swaps	51,407	58,897	68,274	79,161	1,404	1,969	2,214	3,864
Options	9,521	10,933	12,575	13,746	154	222	235	381
C. Equity-linked contracts	1,884	1,881	2,214	2,309	199	205	243	255
Forwards and swaps	329	320	386	364	49	58	62	61
Options	1,556	1,561	1,828	1,944	150	147	181	194
D. Commodity contracts[3]	590	598	777	923	83	75	78	85
Gold	203	231	279	315	21	20	28	28
Other	387	367	498	608	62	55	51	57
Forwards and swaps	229	217	290	402	...	...	...	...
Options	158	150	208	206	...	...	...	...
E. Other[4]	12,906	14,384	16,503	18,337	417	519	609	871
Gross credit exposure[5]	.	.	.	.	1,019	1,171	1,316	1,511

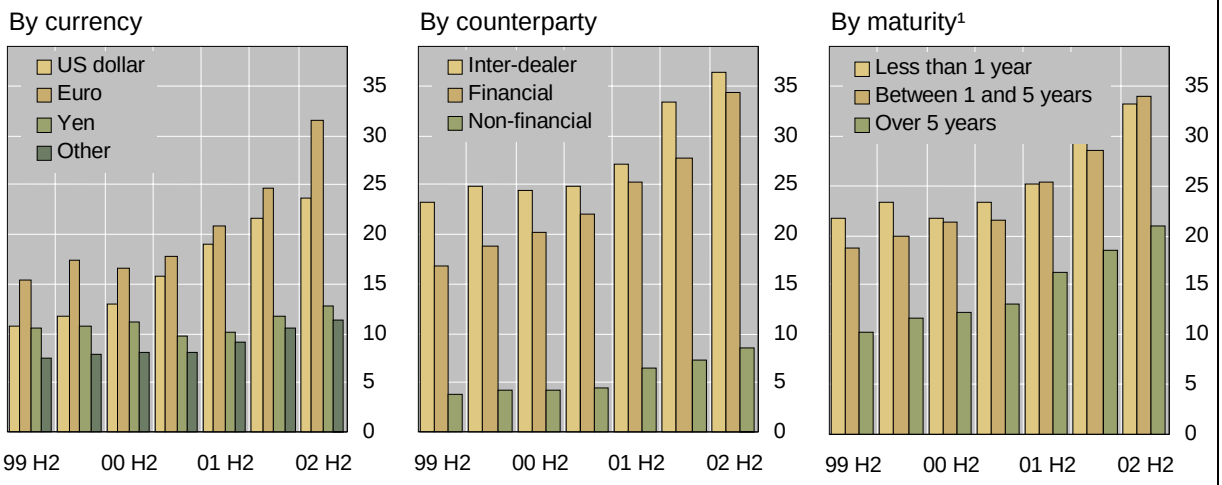
[1] All figures are adjusted for double-counting. Notional amounts outstanding have been adjusted by halving positions vis-à-vis other reporting dealers. Gross market values have been calculated as the sum of the total gross positive market value of contracts and the gross negative market value of contracts 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

reported a 12% rise in commercial bank holdings of derivative contracts (most of which are OTC). Further information is available at www.isda.org and www.occ.treas.gov.

[3] Credit derivatives, which according to market sources have recently grown rapidly, are not included in the semiannual BIS survey of OTC derivatives market activity.

Interest rate swaps

Notional amounts outstanding, in trillions of US dollars



[1] Includes FRAs, which in December 2002 accounted for approximately 6% of the total notional amount outstanding.

Source: BIS. Graph 4.6

The 13% rise in interest rate contracts brought the outstanding amount of such contracts to $101.7 trillion. Interest rate swaps grew by 16% to $79.2 trillion, while interest rate options expanded by 9% to $13.7 trillion. Forward rate agreements (FRAs) declined by 4% to $8.8 trillion, following an unusually pronounced increase in the previous half-year period.

Euro-denominated swaps grow rapidly ...

The euro-denominated interest rate swap market grew particularly rapidly, with the value of outstanding contracts rising by 28% to $31.5 trillion (Graph 4.6). This compared with an 18% expansion in the previous half-year. Although part of this growth reflected an appreciation of nearly 8% in the value of the euro relative to the US dollar (the currency of reference of the BIS semiannual survey) between the two year-end periods, the underlying currency-adjusted increase was nevertheless robust at 20%.

... after uneven pace in recent years

The market for euro-denominated swaps has expanded at an uneven pace in recent years. It grew rapidly in the wake of the introduction of the single European currency as such instruments became new benchmarks for European fixed income markets, paused between the second half of 1999 and the first half of 2001 on completion of the stock adjustment process to the new integrated market, and returned to rapid growth from the second half of 2001. This upswing appears to have been related to two major factors. First, a surge in the issuance of euro-denominated bonds boosted arbitrage and hedging activity by issuers and dealers. Second, the emergence of squeezes in the German government bond market and related exchange-traded derivatives encouraged market participants to switch to more reliable hedging and position-taking instruments for non-government liabilities.[4]

[4] The factors underlying the expansion of the euro interest rate swap market are discussed by Remolona and Wooldridge (see the reference in footnote 2 of the box on page 34). The issue of market squeezes in German government bond futures is discussed in a box published on pages 32–33 of the June 2002 *BIS Quarterly Review*.

Less buoyant business in other swap markets

Activity in the other major interest rate swap markets was somewhat less buoyant than in the euro-denominated segment. The notional amount of US dollar swaps expanded by 10% to $23.7 trillion. This represented a slowdown relative to the 14% recorded in the previous half-year period. The spike in US mortgage refinancing observed in early October continued to support the use of swaps to hedge prepayment risk. However, this increase in hedging transactions was probably followed by a moderation in position-taking in the wake of the Federal Reserve's surprisingly large cut in policy rates in early November. Following the cut, market participants expected fixed income markets to remain stable for the forthcoming months.

Meanwhile, the US dollar value of yen-denominated swaps rose by 9% to $12.8 trillion. Much of the rise resulted from higher positions held by non-dealers.

OTC business accelerates relative to that on exchanges

The most recent numbers also show that OTC business expanded once again relative to that on exchanges. The 11% increase in outstanding OTC contracts in the second half of 2002 compares with a decline of 1% in open positions in exchange-traded contracts over the same period. This pattern of activity contrasts with that observed in 2001, when exchange-traded business outpaced OTC market transactions. This earlier shift to exchanges was attributed by market analysts to potential concerns about counterparty credit risk in OTC markets resulting from the downgrading of some large market participants and increasing concentration of the inter-dealer market. Such concerns reportedly encouraged market participants to shift part of their transactions to exchanges to benefit from their clearing house guarantee.

Measures to maintain the competitiveness of OTC markets

However, OTC market participants have taken a variety of measures to better manage counterparty credit exposures, including a growing use of collateral and bilateral netting agreements.[5] These measures may have helped to maintain the competitiveness of OTC markets.

OTC markets show less erratic growth

It should also be noted that both types of market have expanded at a fairly similar pace since the first half of 1998 (the year in which the BIS initiated its survey of OTC derivatives markets) but that OTC markets have shown less erratic growth. In part, this reflects the fact that hedging or trading in OTC markets involves the writing of new contracts, which leads to a gradual build-up of notional amounts outstanding. In exchange-traded markets, traders prefer to avoid delivery of the underlying by reversing their positions before the maturity of a contract. Such a reversal leads to a decline in open positions because of the offsetting of contracts through the exchange.

[5] ISDA reported the results of a survey conducted in 2003 showing that the amount of collateral used in privately negotiated derivatives transactions had increased by 70% relative to a similar survey conducted in 2002. It noted that collateral covered 55% of fixed income derivatives transactions and 51% of counterparty credit exposures. The OCC also reported that the amount of gross exposure in US banks' holdings of derivatives eliminated through bilateral netting had risen to as much as 81% in the fourth quarter of 2002. Further information is available at www.isda.org and www.occ.treas.gov.