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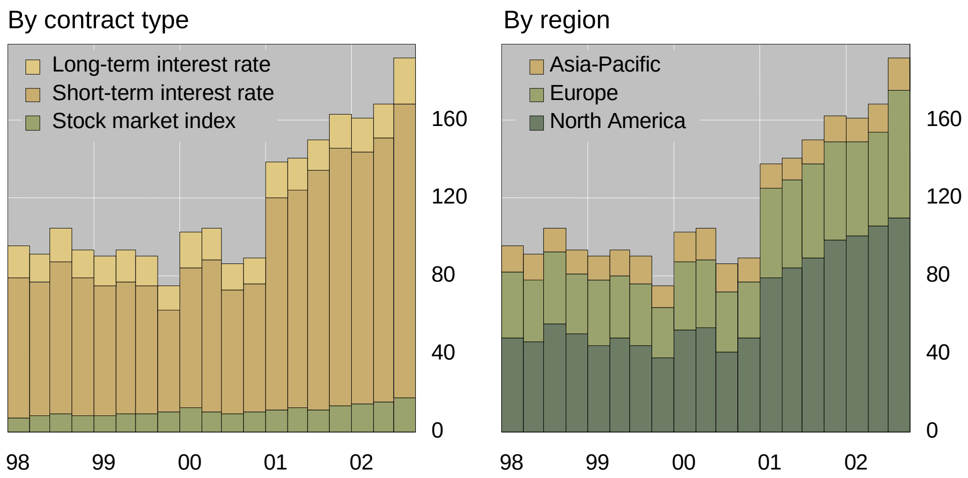
4. Derivatives markets

The aggregate turnover of exchange-traded financial derivatives contracts monitored by the BIS remained high in the third quarter of 2002. The value of trading rose by 14% to $192 trillion (Graph 4.1), following a 4% increase in the previous quarter. While the most robust expansion took place in government bond contracts, activity in money market instruments and stock index contracts was also buoyant. In a departure from the seasonal slowdown usually observed in July, the aggregate volume of transactions in that month nearly matched the record observed in November 2001. This high volume of business reflected a new round of hedging and position-taking as global market uncertainty increased in the wake of further revelations of accounting irregularities, including WorldCom's large restatement of its earnings in late June.

The latest BIS semiannual data on aggregate positions in the global over-the-counter (OTC) derivatives market point to a further acceleration of activity in the first half of 2002. The total estimated notional amount of outstanding OTC contracts stood at almost $128 trillion, a 15% increase over end-December 2001. This compares with an 11% increase in the previous half-year period. Expansion was driven mainly by interest rate instruments, the

Turnover of exchange-traded futures and options

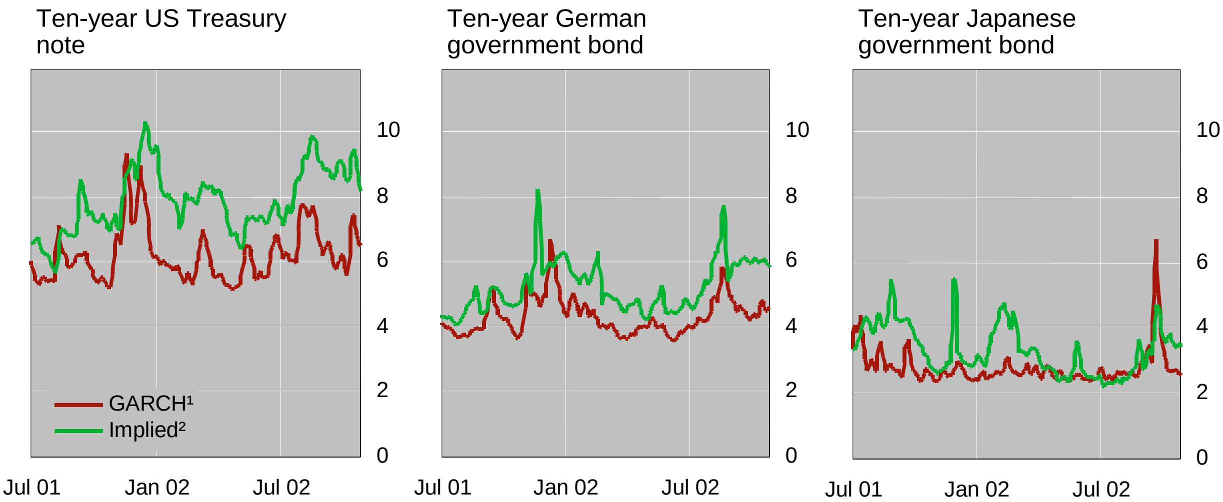
Quarterly data, in trillions of US dollars



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

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 4.2

largest of the broad market risk categories covered by the semiannual BIS survey. These new numbers also show that, in contrast to 2001, OTC business accelerated relative to that on exchanges in the first half of 2002.

Buoyancy of European exchange-traded interest rate products

Sharp increase in government bond business ...

Trading in exchange-traded interest rate contracts expanded by 14% to \$174.4 trillion in the third quarter of 2002, compared with an increase of 4% in the second quarter. Contracts on short-term interest rates, including eurodollar, Euribor and euroyen, accounted for much of the absolute increase in activity, with turnover rising by 12% to \$151.3 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 \$23.1 trillion. The growth of business in interest rate contracts in the third quarter appears to have reflected adjustments to derivatives positions as market participants became more pessimistic about the quality of corporate earnings and economic growth prospects.

... on investor pessimism

Corporate irregularities boost turnover

In a departure from the usual slowdown observed in July, turnover grew particularly strongly in that month, reaching \$61.4 trillion compared with a previous peak of \$64.5 trillion in November 2001. Further revelations of accounting irregularities, including WorldCom's large restatement of its accounts on 25 June, renewed fears of more widespread corporate problems and led to pronounced instability in global financial markets (Graphs 4.2 and 4.4). The ensuing flight to the safety of government bonds created upward pressure on the price and volatility of such bonds, leading some traders in bond futures and options to cover their short positions, and others to position themselves for a further rally in bond markets. Although conditions in financial markets were somewhat calmer in the first three weeks of August, volatility returned at the end of the month as equity markets resumed their descent. Volatility remained high for much of September, with a flurry of weak macroeconomic announcements and disappointing earnings reports in North America and Europe leading to several new episodes of flight to quality.

Surge in European interest rate activity ...

A notable feature of interest rate activity in the third quarter was the surprisingly sharp increase in trading on European marketplaces. The turnover of interest rate contracts on such markets rose by 39% to $62.3 trillion, compared with an increase of 13% to $11.2 trillion on Asian exchanges and an expansion of 3% to $100.3 trillion on North American exchanges. Transactions in money market instruments rose by 39% to $49.2 trillion, while those in government bond instruments were up by 36% to $13.1 trillion. Trading in options was exceptionally robust, almost doubling to $13 trillion.

... on flight to quality movements

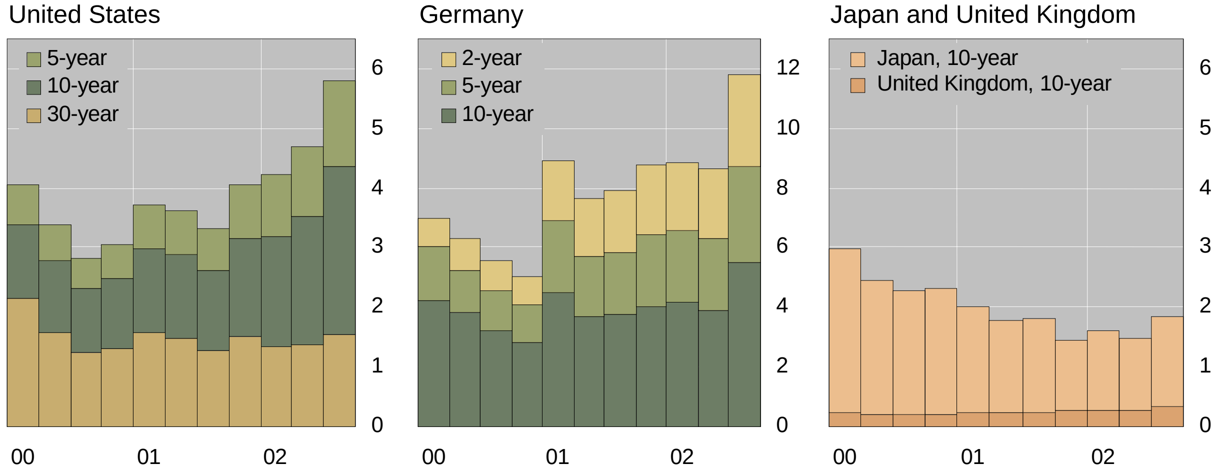
The surge in European contracts appears to have resulted from strong flight to quality movements into fixed income markets as European equity markets faced pronounced downward pressure (see Graph 1.1 in the Overview). Moreover, the emergence of weak macroeconomic data from the end of August, including a larger than expected decline in the closely watched Ifo business climate index on 28 August, dashed hopes of economic recovery in Germany and strengthened expectations of a cut in policy rates.[1] Such changing expectations probably also encouraged a certain amount of speculative trading in German government money market and bond contracts.

Mortgage hedging supports US business

Although aggregate trading on North American exchanges was comparatively subdued, business in government bond contracts was reasonably active, rising by 13% to $1.6 trillion. Trading was reported to have

Turnover in government bond contracts

Quarterly futures contract turnover, in trillions of US dollars

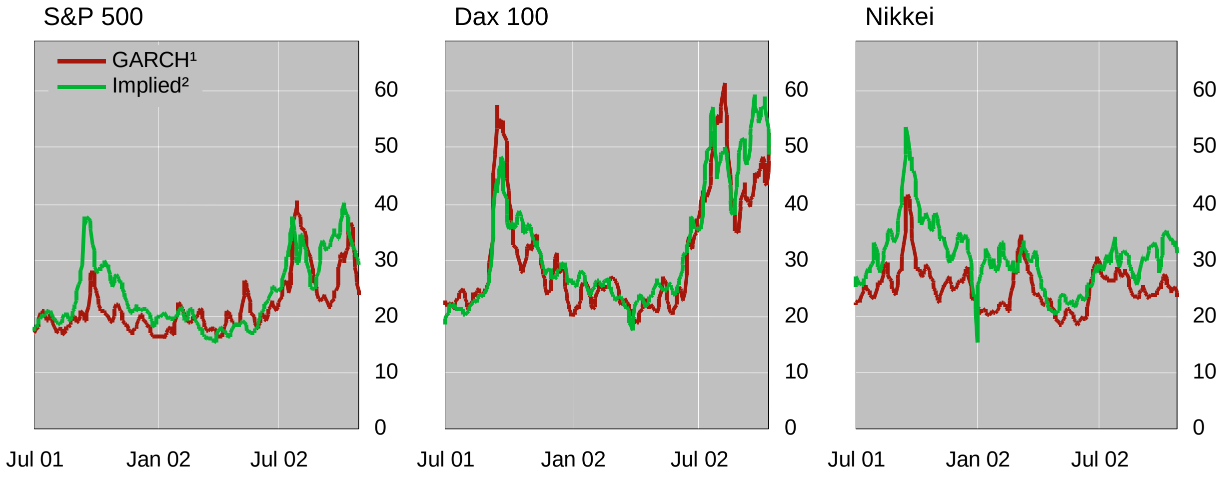


Sources: FOW TRADEdata; Futures Industry Association; BIS calculations. Graph 4.3

[1] This pessimism was reflected in the path of three-month Euribor rates implied by futures prices on contracts with delivery dates in late 2002 and early 2003, which declined appreciably in the third quarter.

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

been supported by the hedging activity of US government-sponsored enterprises (GSEs). With US mortgage refinancing reaching a new record at the end of the third quarter, a large number of mortgages and mortgage-backed securities (MBSs) were subject to early repayments, leading to an abrupt shortening in the average duration of GSEs' assets.[2] In order to minimise mismatches in the duration of their assets and liabilities, GSEs were reported to have sought to lengthen the duration of their assets by various means, including purchasing government bonds and newly arranged MBSs and taking long positions in government bond futures and interest rate swaps.

Turnover of JGB contracts rises sharply

Trading in interest rate products on Japanese exchanges increased by 6% over the review period to $2.5 trillion. A 23% drop in the turnover of money market instruments was more than offset by a 27% increase in trading in 10-year Japanese government bond (JGB) contracts. Turnover in JGB contracts rose sharply in September as investors reacted to the potential fiscal implications of banking reform (see the Overview).

Stock index contracts active as volatility reaches new highs

Overall activity in exchange-traded equity index contracts expanded further in the third quarter of 2002, with turnover rising by 13% to $17.4 trillion. The revelation of new corporate irregularities at the end of June took its toll on global equity markets, leading in the following weeks to an upsurge in volatility

[2] Investors in US MBSs face significant prepayment (or negative 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 of MBSs to call their securities.

and a sharp increase in turnover as investors sought to protect the value of their equity holdings.

Investors make heavy use of stock index contracts

Business expanded in most of the major geographical areas, but the European Union witnessed the most rapid increase (16%), followed by North America (14%) and Asia (9%). Such a pattern contrasted with that seen in recent periods, when trading on Asian marketplaces, particularly in Korea, had accounted for much of the growth in stock index activity. Given concerns about the solidity of financial firms, particularly insurance companies, institutional investors were reported to have made heavy use of stock index contracts to adjust their equity weightings. Stock index futures enable traders to cheaply and quickly lock in a price ahead of actual cash market transactions.

Acceleration of OTC market activity in the first half of 2002

Data from the semiannual BIS survey on positions in the global OTC derivatives market at the end of June 2002 pointed to a further acceleration of activity in the first half of the year. The total estimated notional amount of outstanding OTC contracts stood at almost $128 trillion, a 15% increase over end-December 2001. This compares with an 11% rise in the previous half-year period. The most recent numbers also show that OTC business expanded relative to that on exchanges, since open positions in exchange-traded contracts grew by only 1%.[3] It should be noted, however, that part of this recent growth reflected the higher dollar value of contracts denominated in the euro and the yen as those currencies appreciated relative to the US dollar between the two reporting periods.

Market growth driven mainly by interest rate instruments

Market expansion was driven mainly by interest rate instruments, the largest of the broad market risk categories covered by the semiannual BIS survey on OTC derivatives markets, with the notional amount of outstanding contracts rising by 16%. Activity was equally robust in all three main groups of interest rate products, namely forward rate agreements (FRAs), interest rate swaps and interest rate options. By contrast, business in foreign exchange contracts, the second largest broad market risk category, was less buoyant, with outstanding contracts rising by 8%. Currency options were the main exception, with a surge of 39%.

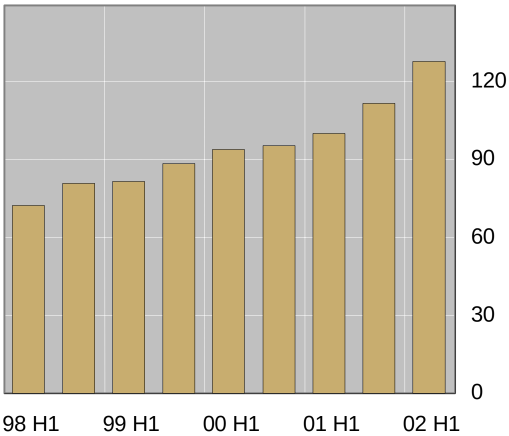
Robust activity in all groups of interest rate products

Equity-linked contracts, where activity had been subdued in recent periods, returned to expansion, with an 18% increase in amounts outstanding.

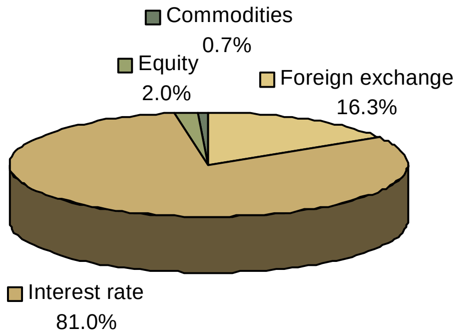
3 However, activity in the two types of markets cannot be directly compared owing to inherent differences in the characteristics and uses of products. In exchange-traded derivatives markets, the reversal of an initial position leads to a decline in open interest because of the offsetting of contracts through a central counterparty. In OTC derivatives markets, such a reversal involves the writing of new contracts, which leads to a build-up of notional amounts outstanding.

Global OTC derivatives

Total notional amounts outstanding, in trillions of US dollars



Breakdown by broad risk category at end-June 2002



Source: BIS.

Graph 4.5

Commodity contracts, the smallest of the broad market risk categories, also returned to growth, with a 30% increase in the value of outstanding contracts.[4]

Buoyancy of the dollar interest rate swap market

Interest rate swaps show a significant increase

Business in interest rate products remained buoyant in the first half of 2002, with a 16% increase in the notional amount of contracts to $90 trillion (Table 4.1). This buoyancy was evident in all three major market segments but the most significant increase in absolute terms took place in interest rate swaps. With $68 trillion in outstanding contracts, they remain by far the largest single group of products in the OTC derivatives market.

Dollar swaps grow steadily on changes in trading practices ...

The US dollar-denominated interest rate swap market continued to grow at a rapid pace, with outstanding contracts rising by 14% to slightly less than $22 trillion. Dollar-denominated swaps have grown steadily in recent years on the back of a shift in hedging and trading practices.[5] A more active use of swaps and swaptions in the hedging of mortgage prepayment risk by mortgage originators and investors was also reported to have boosted business in recent periods. The sharp decline in long-term interest rates between June and early November last year led to a surge of mortgage refinancing and consequently to a shortening of the duration of MBS portfolios. This decline prompted market participants to seek fixed rate payments through swaps and swaptions. Although the stability of long-term interest rates in the first half of 2002 probably reduced investors' demand for hedges against a shortening of

... and mortgage hedging

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

[5] The factors underlying this long-term shift have been discussed in earlier issues of the *BIS Quarterly Review*, including in an article by Philip D Wooldridge, "The emergence of new benchmark yield curves", December 2001, pp 48–57.

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

Amounts outstanding, in billions of US dollars

	Notional amounts				Gross market values			
	End-Dec 2000	End-Jun 2001	End-Dec 2001	End-Jun 2002	End-Dec 2000	End-Jun 2001	End-Dec 2001	End-Jun 2002
Grand total	95,199	99,755	111,115	127,564	3,183	3,045	3,778	4,450
A. Foreign exchange contracts	15,666	16,910	16,748	18,075	849	773	779	1,052
Outright forwards and forex swaps	10,134	10,582	10,336	10,427	469	395	374	615
Currency swaps	3,194	3,832	3,942	4,220	313	314	335	340
Options	2,338	2,496	2,470	3,427	67	63	70	97
B. Interest rate contracts[2]	64,668	67,465	77,513	89,995	1,426	1,573	2,210	2,468
FRAs	6,423	6,537	7,737	9,146	12	15	19	19
Swaps	48,768	51,407	58,897	68,274	1,260	1,404	1,969	2,214
Options	9,476	9,521	10,879	12,575	154	154	222	235
C. Equity-linked contracts	1,891	1,884	1,881	2,214	289	199	205	243
Forwards and swaps	335	329	320	386	61	49	58	62
Options	1,555	1,556	1,561	1,828	229	150	147	181
D. Commodity contracts[3]	662	590	598	777	133	83	75	78
Gold	218	203	231	279	17	21	20	28
Other	445	387	367	498	116	62	55	51
Forwards and swaps	248	229	217	290	...	...	...	...
Options	196	158	150	208	...	...	...	...
E. Other[4]	12,313	12,906	14,375	16,503	485	417	519	609
Gross credit exposure[5]	.	.	.	.	1,080	1,019	1,171	1,316

[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

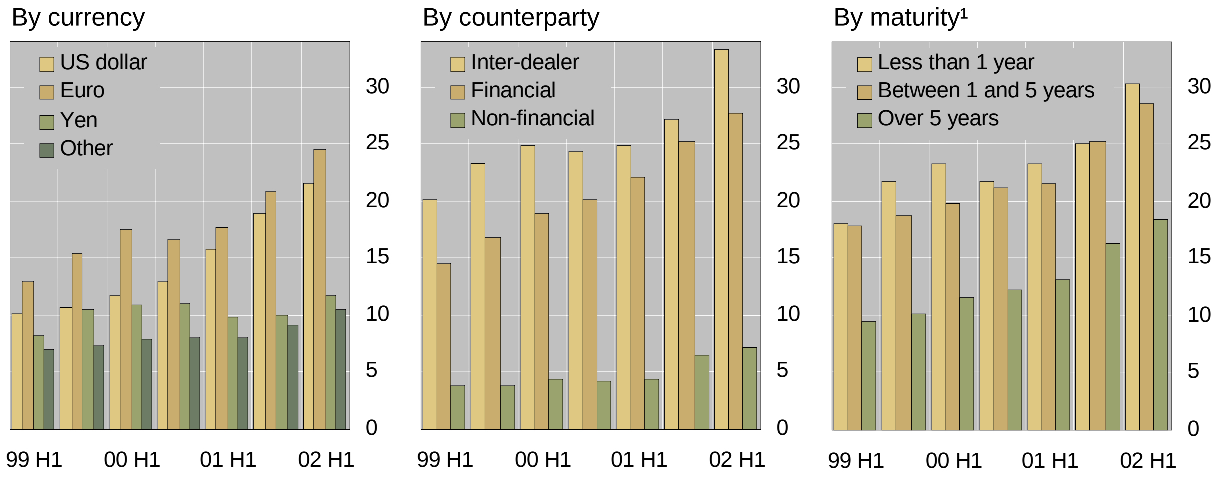
mortgage duration, market participants may have sought additional protection against a possible rebound of interest rates and the opposite risk of duration extension.

Other swap markets are less buoyant

Activity in the other major interest rate swap markets was less buoyant. The notional amount of euro-denominated swaps expanded by 18% in US dollar terms (the currency of reference of the BIS semiannual survey) to slightly less than $25 trillion, but much of that increase resulted from a 13% appreciation of the euro relative to the US dollar between end-December 2001 and end-June 2002. A similar currency effect was at play in the market for yen-denominated swaps. The US dollar value of yen swaps rose by 16% to almost $12 trillion, with most of the increase resulting from a 10% appreciation of the yen relative to the dollar over the two reporting periods.

Interest rate swaps

Notional amounts outstanding, in trillions of US dollars



[1] Includes FRAs, which in June 2002 accounted for approximately 12% of the total notional amount outstanding.

Source: BIS. Graph 4.6

Surge in currency options

Higher currency volatility fuels currency options

The pace of activity in foreign exchange contracts was somewhat lacklustre relative to that in interest rate instruments, with the stock of contracts rising by 8% to $18 trillion. However, business in currency options was an exception to this overall pattern. The notional value of such contracts rose by 39% to $3.4 trillion, with activity picking up in most currency sectors. Contracts involving the US dollar expanded by 28%, those involving the euro by 66%, and those involving the yen by 14%. Market sources attributed the market's buoyancy to a rise in the volatility of major currency pairs (euro/dollar in particular) in the second quarter of the year.

Rise in gross market values

The estimated gross market value of positions in the OTC market increased by 18% to $4.5 trillion, following a 24% rise in the second half of 2001. Much of the increase took place in foreign exchange contracts, reflecting significant movements in the major exchange rates in the first half of 2002 and an upturn in currency volatility in the second quarter.[6] The overall ratio of gross market values to notional amounts was stable at 3.5% but, in the case of foreign exchange instruments, the ratio rose appreciably to 5.8% from 4.7%.

[6] A movement in exchange rates leads to an increase in the value of forward-type contracts for some counterparties and a symmetrical loss for others. In the case of option-type contracts, a change in the implied volatility of exchange rates is accompanied by a corresponding change in the value of contracts.