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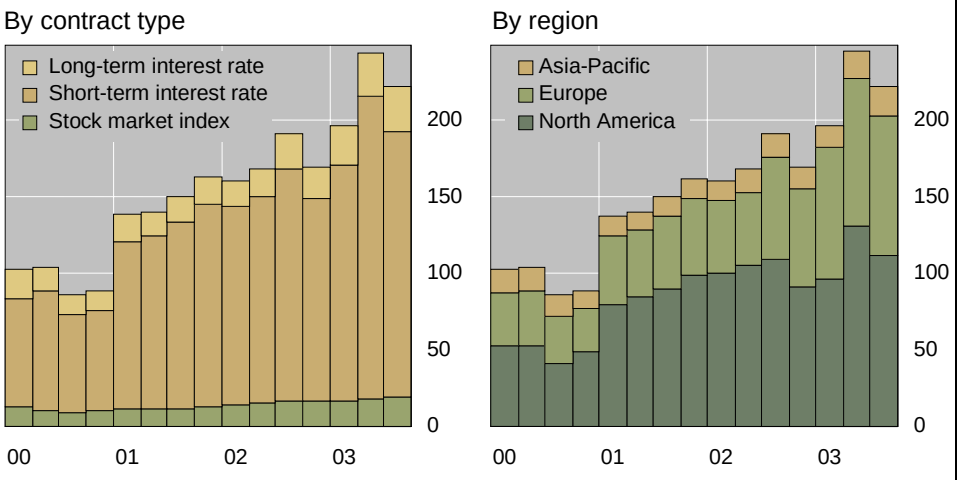
4. Derivatives markets

The aggregate turnover of exchange-traded financial derivatives contracts monitored by the BIS contracted in the third quarter of 2003. The combined value of trading in interest rate, stock index and currency contracts amounted to $223 trillion, a 9% decline from the second quarter (Graph 4.1). Activity was uneven across the two major market risk groups, with turnover in interest rate contracts falling substantially and that in stock index contracts growing moderately. The overall decline in the turnover of exchange-traded fixed income instruments resulted from a pronounced drop in money market contracts on US exchanges, which offset a rise in government bond contracts.

The latest BIS semiannual data on aggregate positions in over-the-counter (OTC) derivatives markets show an acceleration of activity in the first half of the year. The notional amount of outstanding contracts was up 20% to almost $170 trillion, compared with an increase of 11% in the previous period. At the same time, gross market values rose by 24% to $7.9 trillion, compared with a 43% increase in the earlier period. Gross market values have expanded at a more rapid pace than notional amounts since 2001.

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

Contrasting pattern of activity in interest rate contracts

Aggregate trading in exchange-traded interest rate contracts, the largest of the broad market risk categories, declined in the third quarter of 2003. The volume of transactions fell by 10% to $202.8 trillion, compared with an increase of 25% in the second quarter and 18% in the first quarter. This overall decline in fixed income business resulted from a contrasting pattern of activity between the short-term and long-term interest rate segments, with a pronounced drop in money market contracts more than offsetting an expansion in government bond contracts. Turnover in short-term interest rate contracts, including eurodollar, Euribor and euroyen, declined by 13% to $173 trillion, while business in longer-term instruments, including 10-year US Treasury notes, 10-year German government bonds and 10-year Japanese government bonds, rose by 5% to $29.8 trillion.

Contrasting pattern for short- and long-term rate contracts …

Activity on US exchanges accounted for much of the divergence in aggregate transactions between short-term and long-term interest rate contracts. Trading in US money market contracts dropped by 18% to $91 trillion, while transactions in US long-term contracts grew by 18% to $10.5 trillion, leaving overall US fixed income business down by 15% at $101.5 trillion.

… particularly on US exchanges

Volatile markets slow the turnover of interest rate options

The most notable feature of activity in US short-term interest rate contracts was a particularly sharp drop in the trading of options, with transactions falling by 33% to $24.7 trillion. This was the largest percentage fall in the quarterly volume of transactions in such options since 1993, the year the BIS began to collect quarterly data on the value of turnover in exchange-traded financial derivatives. Business in options on eurodollar futures on the Chicago Mercantile Exchange (CME), the largest US marketplace for short-term products, declined by 31% to $15.8 trillion, while that in options on 30-day US federal funds futures on the Chicago Board of Trade shrank by 86% to $0.8 trillion.

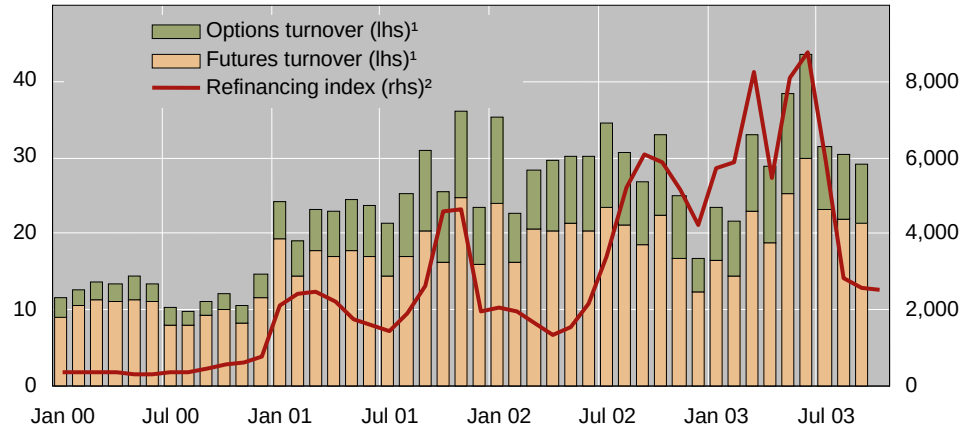
Sharpest drop in US options on short-term rates since 1993

The turnover of options on fixed income instruments tends to exhibit greater variability than the turnover of futures (which declined by only 10% to $66.3 trillion in the third quarter). Options are less actively traded than futures and their liquidity is probably affected to a greater extent by swings in the interest rate cycle or adverse market movements.

Options show greater variability than futures

This is what seems to have happened in the most recent period, with trading apparently hampered by an abrupt change in market conditions. The upward pressure on the yields of US fixed income assets in the second half of June turned in July and August into a fully fledged reversal of the previous market rally. The slackening in the pace of mortgage refinancing (Graph 4.2) confronted holders of mortgage-backed securities (MBSs) with a sudden and significant extension in the duration of their portfolios. In an attempt to bring duration back to their target levels, holders of MBSs entered into a new round

Turnover in US short-term interest rate contracts and US mortgage refinancing index



¹ In trillions of US dollars. ² Refinancing index of the US Mortgage Bankers Association. Monthly average, 16 March 1990 = 100.

Sources: Bloomberg; FOW TRADEdata; Futures Industry Association; BIS calculations. Graph 4.2

of cash market and derivatives transactions. This large volume of rebalancing trades was reported to have strained the market-making capacity of dealers in markets for Libor-based trading instruments, including interest rate swaps and swaptions, causing a sharp increase in market volatility (see the Overview in the September 2003 issue of the *BIS Quarterly Review*). Some dealers were reported to have made significant losses in their market-making and proprietary trading activities, which may have led to a retreat from market-making in the following weeks.

Drying-up of options on the federal funds rate

Another factor accounting for the marked decline in business in short-term interest rate options was a pronounced contraction in transactions related to US monetary policy actions. The expansion in turnover in options on 30-day US federal funds rate futures had been impressive in the second quarter but activity in such contracts nearly dried up in the third.[1] This boom and bust pattern may have reflected the contract's relative "immaturity" given its recent introduction (in the first quarter of 2003).

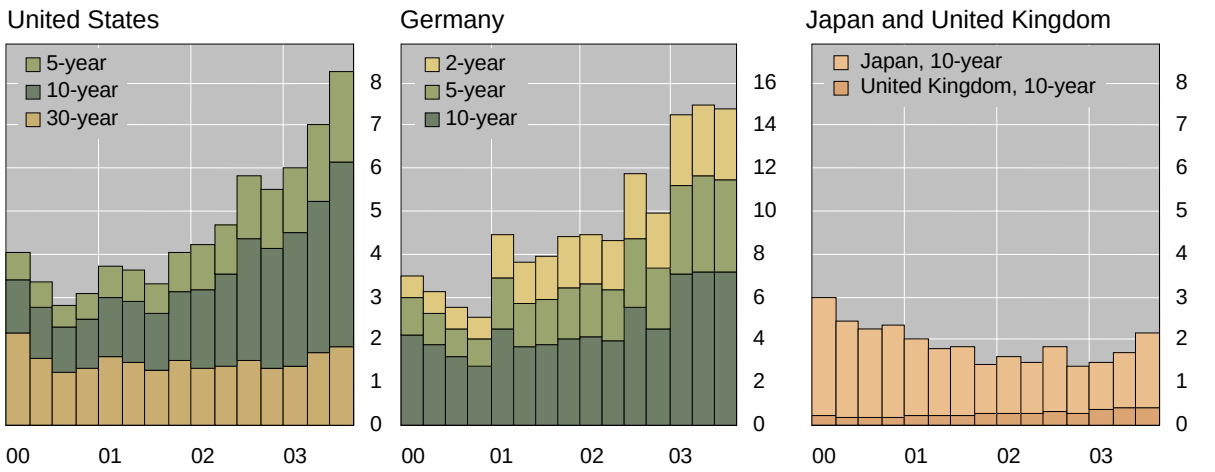
Growth in US government bond contracts

Activity in US government bond contracts was more evenly balanced than that in short-term interest rate contracts, with futures and options accounting in equal measure for the 18% increase in turnover. Business in government bond futures was robust throughout the quarter. Trading in 10-year US Treasury note futures, the most active US government bond contract, was notably buoyant, with a 22% increase in turnover (Graph 4.3). Business in government bond options was less evenly spread, with an all-time peak in July but a drop to more "normal" volumes in the following two months. Activity in government bond futures and options may have benefited from a shift away from Libor-based contracts given the strains observed in markets for such instruments.

[1] Federal funds contracts are directly tied to the federal funds rate, which makes them well suited for trading on US monetary policy actions.

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

Uncertainty about future movements in the US Treasury market remained high throughout the quarter (Graph 4.4).

Overall decline in European fixed income business

Overall business in interest rate products in Europe declined in the third quarter. Turnover fell by 6% to $87.2 trillion, with money market contracts dropping by 7% to $70.6 trillion and government bond contracts down by 3% to $16.6 trillion. The two major categories followed a similar pattern of activity over the course of the quarter. Turnover moderated significantly in July and August, following an all-time peak in business in June.

Buoyancy of Japanese activity …

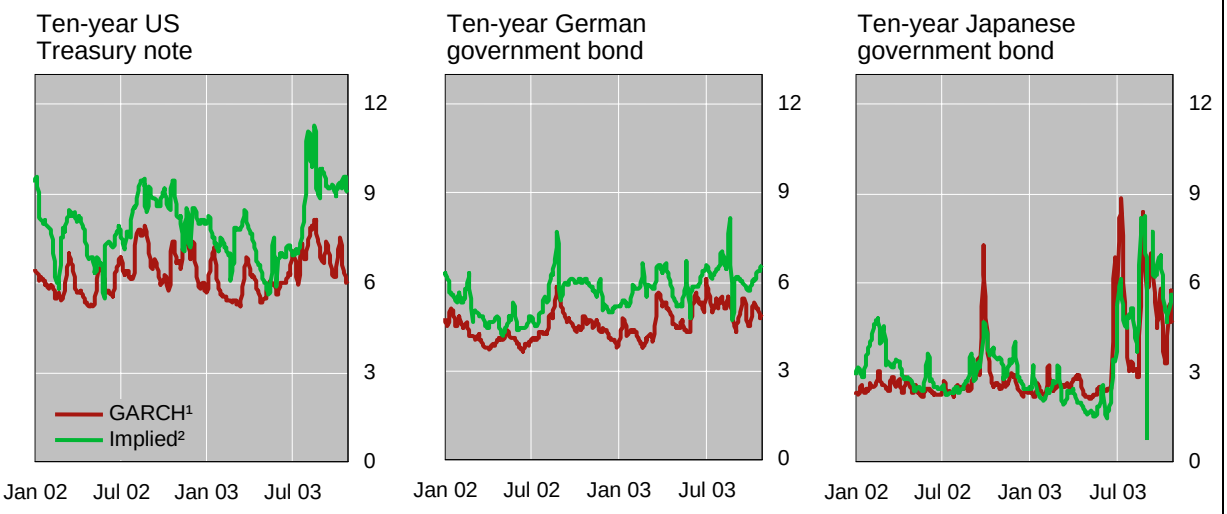
Trading in interest rate products in the Asia-Pacific region rose by 8% to $11.6 trillion. Much of the expansion in the area reflected buoyant activity in Japan, where aggregate turnover rose by 75% to $3.5 trillion. The expansion in activity in Japan was largely accounted for by a near quadrupling in the trading of short-term futures and options to $1.6 trillion. The surge in Japanese money market business appears to have reflected speculation that the Bank of Japan (BOJ) would abandon its "quantitative easing" policy in the wake of improving growth and inflation prospects. However, such rumours, and the accompanying upward pressure on short-term rates, were dispelled by the BOJ's large purchases of nine-month bills at the end of August and a statement by the Governor of the BOJ regarding its policy stance in early September. It is worth noting that the move to quantitative easing in the first quarter of 2001 had been followed by a virtual drying-up of activity in Japanese money market instruments, as traders widely believed that short-term interest rates would remain low for an extended period of time.

… largely in short rate contracts

Activity in Japanese government bond contracts rose by another 25% to almost $2 trillion in the third quarter. Positive data releases and portfolio shifts to equities in the context of a rising stock market led to a sharp drop in the Japanese bond market in July and August, prompting market participants to readjust their balance sheets through derivatives.

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 4.4

Further expansion of stock index contracts

Trading in stock index futures and options expanded for the second consecutive quarter. Aggregate turnover rose in the third quarter of 2003 by 5% to $19.1 trillion. The level of activity varied significantly from one area to another: business in North America declined by 3% to $8 trillion, that in Europe rose by 6% to $3.7 trillion and that in the Asia-Pacific region grew by 15%, reaching $7.2 trillion.

Robust trading in Korean stock index options

The notable increase of activity in Asia was again largely attributable to robust trading in options on the Korea Stock Exchange's KOSPI 200 index, with a rise in turnover of 11% to $5.2 trillion. However, trading in Japanese stock index instruments expanded at a more rapid pace, up by 53% to $1 trillion. The upsurge of business in Japan may have been related to foreign investors' renewed appetite for Japanese equities. Stock index contracts enable buyers to cheaply and quickly lock in a price ahead of actual cash market transactions.

Currency contracts trade at a steady pace

Turnover in exchange-traded currency contracts, which account for less than 1% of overall turnover in financial instruments, remained at the same level as the previous quarter at $1.1 trillion. However, the monthly pattern of activity fluctuated significantly during the course of the quarter. Trading dropped markedly in July and August but recovered smartly in September. Activity in September was driven largely by higher turnover in futures on the dollar/euro rate (up by 35% to $156.3 billion) and the dollar/yen rate (up by 72% to

The rise of pan-European equity index trading

The introduction of the euro on 1 January 1999 had a significant influence on the financial markets of the euro area. In equity markets, in particular, the elimination of exchange rate risk prompted investors to attach less importance to country-specific factors in the determination of stock prices and put greater emphasis on pan-European sectoral factors. Research shows that this change in the relative importance of country- and sector-related factors has been reflected in the determination of equity prices for a number of the largest continental European firms.[1] The effect of pan-European sectoral factors now outweighs the impact of country factors.

This shift to a pan-European outlook has also had an influence on activity in European exchange-traded derivatives markets. Exchanges reacted to the need for regional trading instruments by developing, in combination with index providers, a large number of new pan-European stock market indices and related derivatives contracts.

This movement began even before the introduction of the euro. In May 1998, LIFFE (the predecessor of Euronext.liffe) and AEX (the predecessor of Euronext Amsterdam) jointly launched a futures contract on the FTSE Eurotop 100 index, while in June 1998 the ParisBourse/MATIF (the predecessor of Euronext Paris), the DTB (the predecessor of Eurex) and the Swiss Exchange/ SOFFEX introduced separate contracts on the pan-European Dow Jones STOXX 50 and the euro area-specific Dow Jones EURO STOXX 50 indices. Such contracts enjoyed a monopoly for nearly a year until competing instruments began to appear. In May 1999, LIFFE launched contracts on a number of broader MSCI indices (the MSCI Pan-Euro Index and the MSCI Euro Index) and FTSE Eurotop indices (Eurotop 300, Eurotop 300 ex UK and Eurobloc 100).

Those contracts, and the many that followed, have experienced mixed fortunes. The only one to have been truly successful is the Dow Jones EURO STOXX 50 contract. The version traded on Eurex is now the most active stock index instrument in Europe, exceeding trading in the Dax contract, the most active country-based European contract, by a wide margin. The other pan-European or euro area-specific contracts have generally failed to find broad market acceptance.

The experience of European stock index trading stands in sharp contrast to that in the United States. In Europe, activity has been dominated by a narrow stock index, the Dow Jones EURO STOXX 50, while in the United States the most active stock index contract has been based for a long time on a broad market index, the S&P 500.

The strong performance of the Dow Jones EURO STOXX 50 contract has been something of a surprise to market participants. Many had expected European activity to follow the US pattern of successful trading in a broad index. The popularity of the S&P 500 contract can be explained by three main factors. First, the S&P 500 Index provided a reasonable proxy for the US market as a whole, which meant that it was widely used by institutional investors for benchmarking purposes. Second, its constituent stocks were generally highly liquid, which made it easy for traders and arbitrageurs to create a basket of cash instruments replicating its performance. Third, the S&P 500 was able to benefit from the window created by the Dow Jones Company's initial decision not to license its index to any exchange. This combination of market representativeness and liquidity made it natural for investors to use S&P 500 contracts for hedging and trading purposes.

The structure of equity markets in the euro area made the race for benchmark status significantly more complicated than in the United States. In particular, the ideal combination of market representativeness and liquidity was difficult to achieve in Europe. The main reason for this was that European equity markets were more fragmented than US markets when the euro was introduced. There was less consensus concerning the appropriate pan-European benchmark. As a result, market participants continued to trade in the national contracts for a fairly long period after the introduction of the single currency, which apparently hampered activity in the nascent pan-European contracts.[2]

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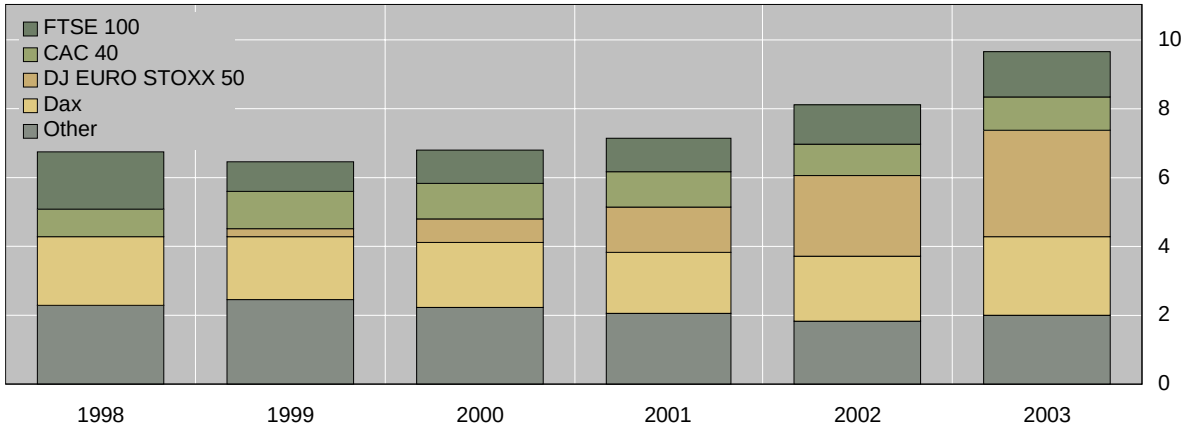
[1] See G Galati and K Tsatsaronis, "The impact of the euro on Europe's financial markets", *BIS Working Papers*, no 100, July 2001, and E Ametistova and Y Sharaiha, "European stock selection: the factors that matter", Morgan Stanley Global Equity and Derivatives Markets, December 2002. [2] This occurred despite the fact that investors in pan-European index products would have enjoyed a number of advantages relative to alternative trading strategies involving a basket of national index contracts, such as savings in trading commissions, the posting of a single margin deposit rather than several (which must be rolled over at set intervals) and exposure to a single clearing house.

Turnover of major European stock index futures

In trillions of US dollars



Note: For 2003, turnover data for the first three quarters at an annual rate.

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

This fragmentation also had a bearing on the type of index that could be traded successfully. Although institutional investors often measured their performance against broad-based market indices, such as the Financial Times Actuaries Europe or the MSCI Europe, such indices included a number of stocks that lacked sufficient market liquidity. The low liquidity of a fraction of component stocks made index replication strategies more complex and expensive to implement than would have been the case with a more liquid set of underlying stocks. It also made it difficult for traders to arbitrage between the underlying baskets of shares and the relevant contracts.

These problems explain why trading gravitated to narrower market indices such as the Dow Jones EURO STOXX 50. These indices are easier and cheaper for portfolio managers to track, replicate and use for arbitrage purposes. Moreover, despite their higher volatility and tracking risks relative to the broader benchmarks, their correlation with broad indices is sufficiently high to make them attractive instruments for hedging and trading purposes.[③]

The introduction of the euro has also resulted in another noteworthy development. Pan-European sectoral indices have seen only a moderate expansion. Some market participants have explained this by the prevalence of a bear market between the first quarter of 2000 and the first quarter of 2003. Investors were reportedly reluctant to take exposures on particular industries, which apparently led them to shift away from sectoral indices (illustrated by the closure of several sector funds) and back towards country or pan-European indices.

[③] The correlation between the Dow Jones EURO STOXX 50 index and the MSCI Europe stood at 97% between 1 January 1999 and 30 September 2003.

Upswing in currency contracts in September

$77.8 billion) on the CME, the largest marketplace in the world for exchange-traded currency contracts. The upswing was fuelled in large measure by the G7 countries' call in late September for more exchange rate flexibility. The statement, which was viewed by the foreign exchange market as an implicit criticism of intervention by Asian countries to keep their currencies at low levels relative to the dollar, prompted a plunge in the dollar to a three-year low against the yen on 22 September.

Broad-based expansion of OTC markets

Acceleration of OTC business

The latest BIS semiannual data on aggregate positions in global OTC derivatives markets at the end of June 2003 show an acceleration of activity in the first half of the year. The estimated notional amount of outstanding OTC contracts rose by 20% to almost $170 trillion in the most recent half-year period, compared with an increase of 11% in the previous period. This robust expansion was in line with data reported by other market sources.[2] At the same time, gross market values continued to grow more rapidly than notional amounts, up 24% to $7.9 trillion.

All segments of OTC market are active

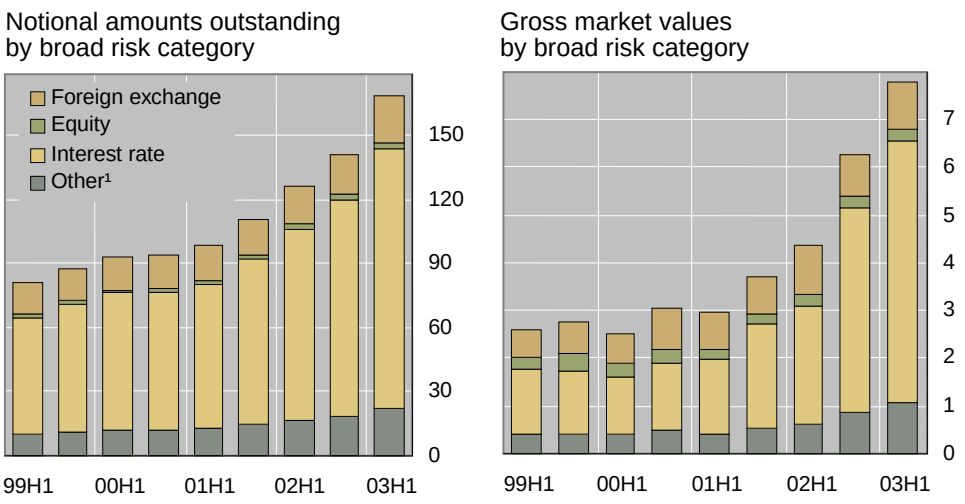
One of the most notable features of activity in the first half of 2003 was the broad-based nature of the expansion. In recent years market activity has been driven mainly by interest rate instruments, the largest of the broad market risk categories. This time, however, business was equally buoyant in interest rate, foreign exchange and equity-linked instruments, with outstanding amounts in each segment growing by about 20%. Business in commodity contracts, the smallest of the major groups of instruments, grew at a weaker pace, up by 13%.[3]

Noteworthy rise in OTC currency contracts …

Within this overall expansion, the 20% increase in the stock of foreign exchange instruments was particularly noteworthy. This market segment has never grown so rapidly since the BIS began collecting semiannual data on OTC

Global OTC derivatives

In trillions of US dollars



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

Source: BIS. Graph 4.5

[2] 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 22% increase in the global stock of OTC contracts in the first half of 2003, while the OCC reported a 17% rise in commercial bank holdings of derivatives 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 currently not included in the semiannual BIS survey of OTC derivatives market activity.

Global OTC derivatives market[1]

Amounts outstanding, in billions of US dollars

	Notional amounts				Gross market values			
	End-Dec 2001	End-Jun 2002	End-Dec 2002	End-Jun 2003	End-Dec 2001	End-Jun 2002	End-Dec 2002	End-Jun 2003
Grand total	111,178	127,509	141,679	169,678	3,788	4,450	6,360	7,908
A. Foreign exchange contracts	16,748	18,068	18,460	22,088	779	1,052	881	996
Outright forwards and forex swaps	10,336	10,426	10,719	12,332	374	615	468	476
Currency swaps	3,942	4,215	4,503	5,159	335	340	337	419
Options	2,470	3,427	3,238	4,597	70	97	76	101
B. Interest rate contracts[2]	77,568	89,955	101,658	121,799	2,210	2,467	4,266	5,459
FRAs	7,737	9,146	8,792	10,270	19	19	22	20
Swaps	58,897	68,234	79,120	94,583	1,969	2,213	3,864	5,004
Options	10,933	12,575	13,746	16,946	222	235	381	434
C. Equity-linked contracts	1,881	2,214	2,309	2,799	205	243	255	260
Forwards and swaps	320	386	364	488	58	62	61	67
Options	1,561	1,828	1,944	2,311	147	181	194	193
D. Commodity contracts[3]	598	777	923	1,040	75	79	86	110
Gold	231	279	315	304	20	28	28	22
Other	367	498	608	736	56	51	58	88
Forwards and swaps	217	290	402	458	...	...	...	...
Options	150	208	206	279	...	...	...	...
E. Other[4]	14,384	16,496	18,330	21,952	519	609	871	1,083
Gross credit exposure[5]	.	.	.	.	1,171	1,317	1,511	1,750

[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

markets in the first half of 1998 and, with $22.1 trillion in outstanding contracts, it has reached its largest size ever.

... particularly options

All of the three main components of the market for foreign exchange derivatives were active in the most recent period. Outright forwards and forex swaps, the largest subsegment, which had been stagnant since 1999, advanced by 15% to $12.3 trillion. Cross-currency swaps grew at a similar pace to $5.2 trillion. Currency options, however, were the most dynamic subsegment, expanding by 42% to $4.6 trillion. Options involving the US dollar increased by 36% to $1.9 trillion, those involving the euro by 55% to $1.3 trillion and those involving the yen by 4% to $0.6 trillion.[4] The dollar had been comparatively stable relative to the euro in the second half of 2002. However, it embarked on a steep downward trend from December 2002 onwards. This appears to have prompted non-financial customers to seek

[4] Some of the smaller currency markets expanded even more rapidly. Options involving the pound sterling, the Swiss franc and the Canadian dollar grew by 74%, 92% and 152% respectively.

protection. Indeed, holdings of currency options by such users rose by 91% in the most recent review period.

Growing use of barrier options

Market participants also noted an increase in the use of barrier options, which are path-dependent instruments that are either cancelled or activated if the underlying exchange rate reaches a predetermined level ahead of stated expiration. Due to the probability of their early expiration, such options tend to be marketed as low-cost alternatives to regular currency options. However, they can be considerably more difficult for intermediaries to hedge than standard products because their value and price sensitivity is subject to large swings when the underlying exchange rate is near or at the barrier. For that reason, barrier options are often associated with significant flows of rebalancing hedges when the exchange rate approaches or crosses the barrier.[5]

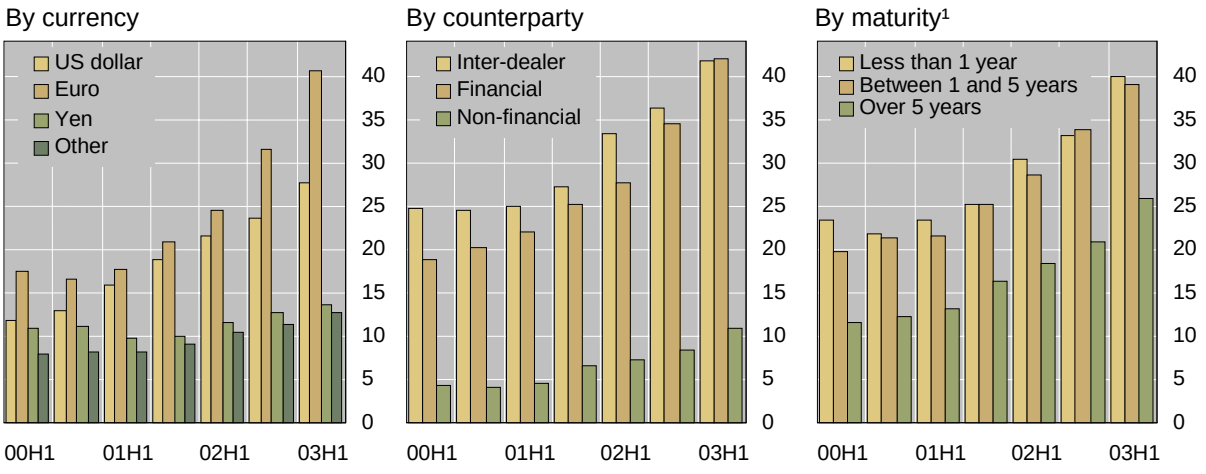
Activity in the market for interest rate products also accelerated in the first half of 2003. The notional amount of contracts grew by 20% to $121.8 trillion. This compares with a rise of 13% in the previous half-year period. Interest rate swaps grew by 20% to $94.6 trillion, interest rate options by 23% to $17 trillion and forward rate agreements (FRAs) by 17% to $10.3 trillion.

Euro and dollar swap markets again grow rapidly ...

The euro-denominated interest rate swap market continued to grow particularly rapidly, with the value of outstanding contracts rising by 29% to $40.7 trillion (Graph 4.6). This followed an expansion of 28% in the previous half-year. Although part of this growth reflected an appreciation of nearly 10% in the value of the euro relative to the US dollar (the currency of reference of the BIS semiannual survey) between the two periods, the underlying currency-adjusted increase remained robust. Activity in the US dollar interest rate swap

Interest rate swaps

Notional amounts outstanding, in trillions of US dollars



[1] Includes FRAs, which in June 2003 accounted for approximately 8.4% of the total notional amount outstanding.

Source: BIS. Graph 4.6

[5] See J Hull, *Options, futures and other derivatives*, Fifth edition, Prentice Hall, 2002.

market was also buoyant, with the notional amount of contracts rising by 17% to $27.6 trillion. This continued growth of activity in euro- and dollar-denominated swaps was somewhat surprising given the narrow range within which yields on fixed income assets evolved between January and April. However, the rally in fixed income markets between early May and mid-June is likely to have generated a wave of transactions for balance sheet repositioning.

... with buoyant activity at the end of the period

The dollar value of yen-denominated swaps rose by 6% to $13.5 trillion. Currency valuation effects only played a marginal role in the yen-denominated market, with the yen depreciating by 1% between the two half-year periods.

Gross market values grow at a robust pace

Gross market values continued to grow at a robust pace in the first half of 2003, up by 24% to $7.9 trillion. Gross market values measure the replacement cost of outstanding contracts had they been settled on the last day of a given reporting period (in this case 30 June 2003). As such, they are a more accurate indicator of counterparty credit risk than notional amounts.[6] The increase in these values once again exceeded that in notional amounts (Graph 4.5). The overall ratio of gross market values to notional amounts thus rose to a new high of 4.7% at end-June 2003.[7]

Interest rate products drive gross market values

The ratio has fluctuated noticeably over the years. It followed a declining trend between the first half of 1998 and the second half of 2000, to a low of 2.7%, and then rose to a new high in the most recent review period. Interest rate products, particularly swaps, have accounted for much of the recent increase in overall gross market values. Whereas the ratio for such instruments varied between 2 and 3% between the first half of 1998 and the first half of 2002, it stood at 4.5% in the first half of 2003. This increase may have been related to the rally observed in fixed income markets between early 2000 and mid-2003. The downward trend in swap yields 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.

OTC business slows relative to that on exchanges

The most recent numbers on the OTC market show that OTC business was slower than exchange-traded activity in the first half of 2003 (Graph 4.7). As discussed above, the stock of outstanding OTC contracts rose by 20%

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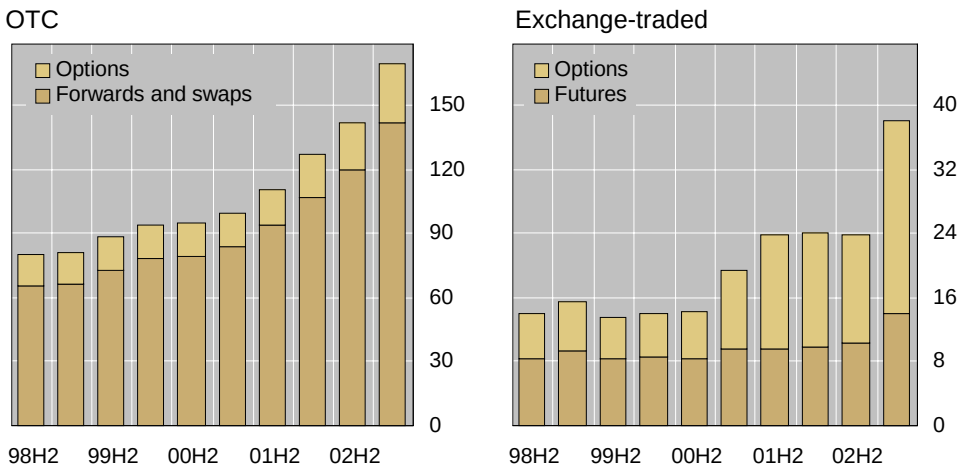
[6] The gross market value of forward-type contracts is generally zero at the initiation of the contract, while that for options depends on the premium paid for protection. However, subsequent changes in the prices of underlying assets lead to the emergence of symmetric mark to market gains and losses between counterparties. Hence, gross market values tend to reflect changes in the prices or volatility of financial market assets.

[7] It should be stressed that gross market values overstate actual credit exposures, since they exclude bilateral netting and other risk-reducing arrangements such as collateralisation. Allowing for netting lowers the derivatives-related credit exposure of reporting institutions to $1.8 trillion.

Global derivatives positions

Amounts outstanding in trillions of US dollars



Sources: FOW TRADEdata; Futures Industry Association; BIS. Graph 4.7

OTC markets grow at a steady pace

compared with an increase in open positions on exchanges of 61%. This pattern of business contrasts with that observed in 2002, when OTC activity easily outpaced stagnant business on exchanges. Both types of market have expanded substantially since 1998 but OTC markets have developed at a steadier pace. 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.