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4. Derivatives markets

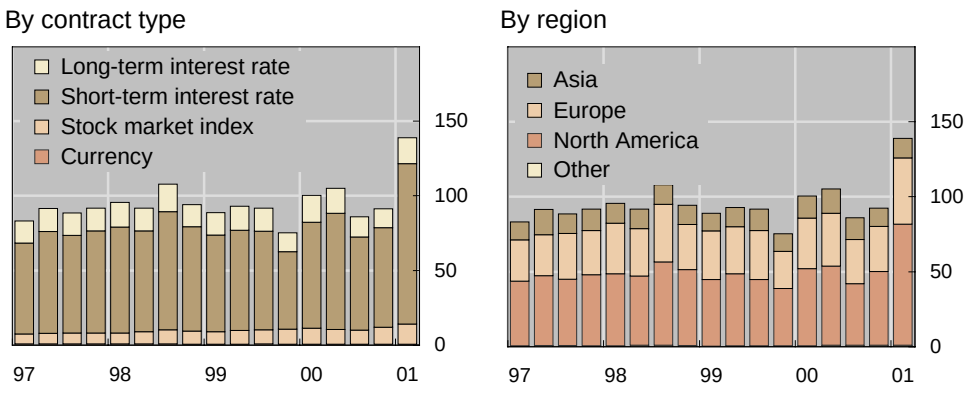
Recent data on exchange-traded and over-the-counter (OTC) market activity suggest a possible reversal of roles between the two market segments. The expansion of the notional amount of outstanding OTC contracts slowed down considerably in the second half of 2000, while the value of turnover on exchanges rose by a record amount in the first quarter of 2001. If sustained, this would represent a significant departure from previous patterns since the growth of OTC activity has consistently outpaced that on exchanges in recent years. The most notable feature of the moderation in OTC activity was a decline in inter-dealer transactions, particularly in euro-denominated interest rate swaps. The surge in exchange-traded business was led by short-term interest rate contracts, with the surprise cut in US policy rates in January apparently fuelling trading.

Surprise cut in US policy rate fuels money market activity

Activity in exchange-traded markets expanded sharply in the first quarter of 2001, with the dollar value of contracts monitored by the BIS rising by 50%, to $138.9 trillion. Interest rate contracts grew by 55%, to $124.8 trillion, and equity contracts expanded by 16%, to $13.4 trillion.

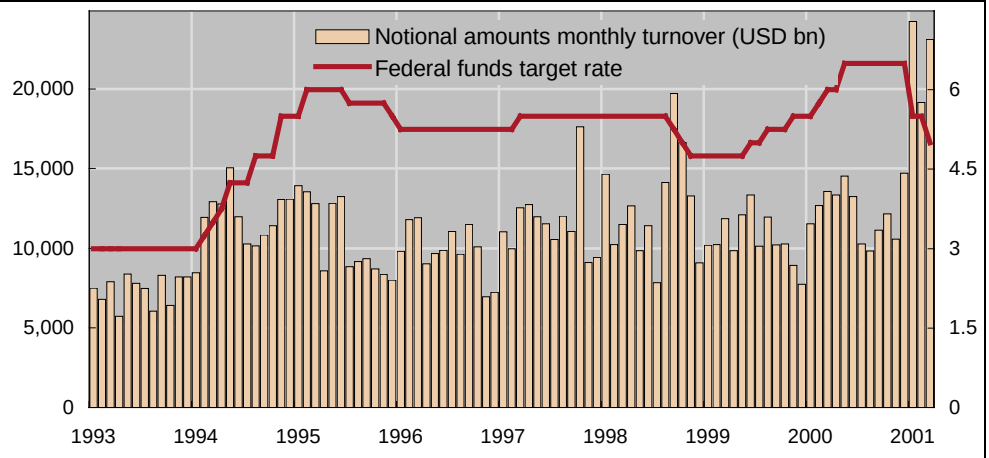
Turnover of exchange-traded futures and options

Quarterly data, in trillions of US dollars



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

Federal funds target rate and short-term interest rate contracts



Sources: Datastream; FOW TRADEdata; Futures Industry Association. Graph 4.2

Surprise US easing leads to surge in short-term contracts

Developments in short-term fixed income markets took centre stage, with the turnover of money market contracts rising by 61%, to $107.3 trillion. Activity was particularly buoyant on short-term US dollar rates (up by 76%) and on the Euribor (by 50%). The surge in short-term US contracts seems to have been primarily related to the surprise caused by the 50 basis point inter-meeting cut in the federal funds target rate in early January and by the possibility of futher monetary easing. In the case of Europe, the Eurosystem did not reverse its tightening stance of the first half of 2000 but market participants' expectations of lower short-term rates appear to have supported turnover in Euribor contracts. Activity in short-term contracts may have received an additional boost from second-round effects working through other market segments. For example, the Fed's rate cut was followed by a sharp recovery in the issuance of dollar-denominated corporate debt (see Section 3). This issuance is likely to have generated activity in the interest rate swap market as issuers swapped between fixed and floating rate liabilities. The increase in swap transactions may in turn have been associated with more active money market business, particularly in eurodollar futures, since such instruments are commonly used in the hedging of swaps.

Change in market conditions also affects longer-term instruments

The global adjustment to the cut in the US policy rate also supported overall activity in longer-term instruments, with business rising by 29%, to $17.5 trillion. However, the geographical pattern of activity differed from that observed in the short-term segment, with the turnover of instruments on European government bonds rising by more than that on US government bonds (49% versus 21%).

Turnover of bond contracts rises sharply on Eurex

One of the most notable developments in Europe was the sharp increase of activity in government bond contracts traded on Eurex. The long-term contract ("bund") expanded rapidly and remained by far the most active bond contract in the world (with transactions rising by 51%, to $4.3 trillion) but turnover in the intermediate maturity contracts ("schatz" and "bobl") grew even faster. While the overall increase in the turnover of German contracts probably

reflected expectations of an easing of monetary policy, the more rapid expansion of business in intermediate contracts may have been related to the growing acceptance of intermediate German government securities as European benchmarks. Business in the "notionnel" contract on Matif/Euronext, currently the only alternative to Eurex's bund contract, also expanded at a fairly robust pace (25%), although turnover in that contract remains much smaller than that in the bund.

Further recovery of activity in US bond contracts

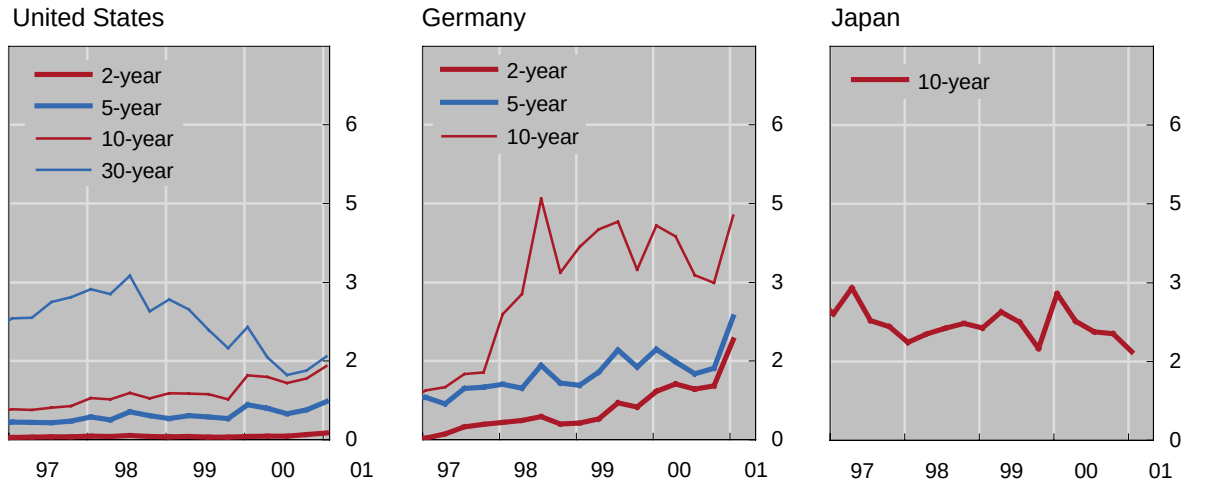
The Fed's easing of policy rates in early January, together with mixed evidence concerning the duration of the US economic slowdown, underpinned a broad-based recovery of turnover in US government bond contracts (Graph 4.3). It should be noted that the 10-year Treasury note futures, which had been expected by some market participants to trade more actively than the Treasury bond contract, ended up tracking closely its slightly more active counterpart. Net repayments of US government debt, combined with a shift of issuance to intermediate maturities, have affected the liquidity of the US Treasury bond contract in recent periods, leading some commentators to predict its eventual demise.

Volatility in global equity markets leads to recovery in index contracts

Shifting sentiment about the depth and length of the global economic slowdown accentuated volatility in most major equity markets, leading to a further recovery of activity in equity index contracts. The value of turnover rose by 16%, to $13.4 trillion. As in the previous quarter, option contracts grew more rapidly than futures (by 21% versus 12%). North American exchanges accounted for much of the increase in business (by 23%, to $8.2 trillion). Transactions on the CBOE grew particularly rapidly (by 38%, to $3.7 trillion) and the exchange nearly matched the volume of index business conducted on the CME ($4.3 trillion). European markets also witnessed a fairly rapid expansion of activity (12%, to $3.1 trillion). By contrast, activity in the Asia-Pacific area remained subdued.

Turnover in government bond contracts

Quarterly futures contract turnover, in trillions of US dollars



Sources: FOW TRADEdata; Futures Industry Association.

Graph 4.3

Exchanges introduce products based on swap rates, agency securities and single stocks

A squeeze on Eurex encourages alternative instruments

Exchanges introduced a number of new contracts during the course of the quarter. This was in response to anticipated new demands or to changes in the pattern of activity in underlying markets. For example, the recent squeeze experienced by Eurex on its medium-term government bond contract encouraged LIFFE to reintroduce futures on euro-denominated swap rates in March (see the box on pages 32 and 33). The SwapNotes contracts are expected to be less prone to squeezes because the euro-denominated swap market is considerably larger than the stock of government securities underlying the futures contracts. The swap curve's growing role as a homogeneous euro zone benchmark should also help ensure market acceptance of these new contracts.

Meanwhile, some US exchanges moved to capitalise on the upward trend in state agency and asset-backed financing by launching contracts on US agency benchmarks and mortgage-backed securities. For example, in early January the CBOT introduced five-year agency note futures and options, while in late March it launched mortgage-backed futures and options.

In the area of equity contracts, LIFFE and the Montreal Exchange attracted the attention of the industry with the introduction of futures on single stocks. LIFFE's Universal Stock Futures on 25 large European and US companies met with a favourable response, with turnover amounting to almost 10% of the exchange's business in options on single equities. The major US exchanges have also expressed strong interest in such products and are planning to market them as soon as they receive authorisation later this year. By March, LIFFE and Nasdaq had already announced that they would introduce electronic trading in US stock futures through a US-regulated joint venture.

Global OTC market slows in the second half of 2000

The latest data from the BIS semiannual survey on positions in the global over-the-counter (OTC) derivatives market point to a slowdown of market growth in the second half of 2000. The total estimated notional amount of outstanding OTC contracts stood at $95.2 trillion at end-December 2000, a 1% increase over end-June 2000 and an 8% increase since end-December 1999. At the same time, however, gross market values rose by 24%, to $3.2 trillion.

In terms of broad market risk categories, the two largest market segments, interest rate and foreign exchange contracts, grew at the slowest pace (1%), while equity-linked and commodity-related contracts expanded rapidly (by 15% and 13% respectively).[6] Three other significant developments are worth

[6] Credit derivatives, which according to market sources have recently grown rapidly, are not identified in this survey.

Anatomy of a squeeze

Serge Jeanneau and Robert Scott

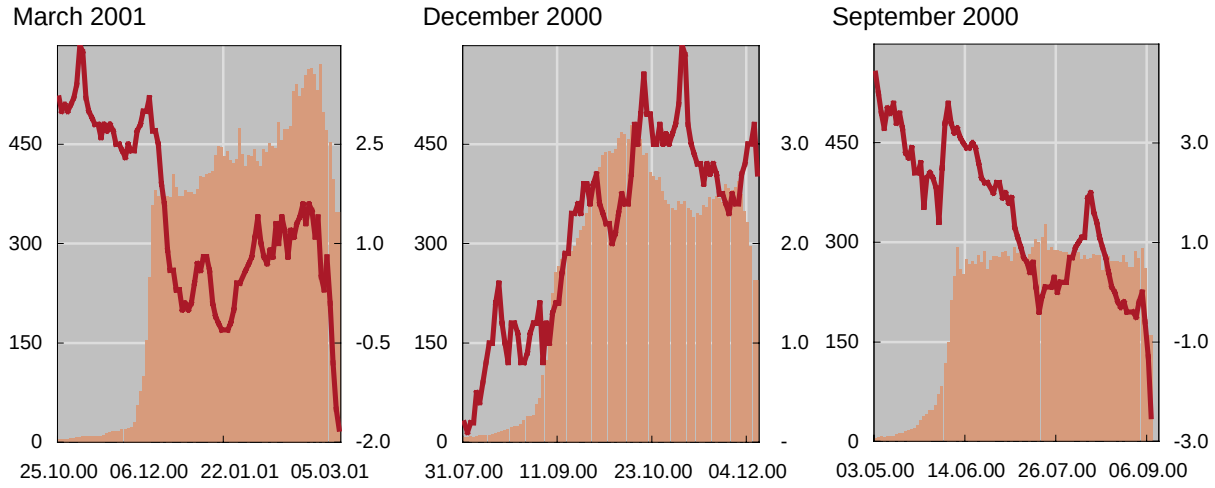
The remarkable success of German government bond contracts has created some difficulties in recent years. Most recently, a market squeeze on the "bobl" contract was reported during the first quarter of 2001.[1] The bobl is the five-year German government note, which is used as the underlying asset for related futures and options traded on Eurex. A small number of European banks apparently cornered the "cheapest-to-deliver" (CTD) note for the contract maturing in March 2001, causing major losses to traders with short positions. This was not the first such incident on Eurex. Similar squeezes have also affected the long-term bond contract ("bund"), the most notable cases being in September 1998 and June 1999.[2] This box examines the squeeze that occurred on the bobl in March 2001.

The use of futures and options on German government bonds expanded rapidly in the second half of the 1990s as the underlying securities gained acceptance as benchmarks for hedging and position-taking on euro zone interest rates. As a result, the amount of exposure in these contracts has become substantially larger than that on the underlying securities. The build-up of large open futures positions relative to the available stock of deliverable securities has at times allowed some traders to "squeeze" other market participants.

In futures markets, squeezes occur when holders of short positions cannot acquire or borrow the securities required for delivery under the terms of a contract. Delivery does not normally pose a problem for traders because the majority close their positions with offsetting transactions prior to contract expiry. However, a trader who remains short at the contract's expiration is obliged to deliver the specified securities, just as one who remains long must take delivery. Because of the difficulty in obtaining transparent prices in bond markets, most contracts on government bonds require physical delivery. This is in contrast to contracts on interbank rates and equity indices, which are settled in cash on the basis of transparent price indices. Physical delivery requires specification of the range of eligible securities and a pricing mechanism to

Five-year Bobl open interest and spread between CTD and next cheapest security

Open interest in millions of contracts (bars - lhs) and basis points (lines - rhs)



Sources: Datastream; Reuters; BIS calculations.

[1] See "Le marché est confronté au 'squeeze' des titres allemands admis sur Eurex", *L'Agefi*, 9 March 2001, and "Bobl squeeze may help Eurex rivals", Wall Street Journal Europe, 9 April 2001. [2] Wolfgang Schulte analyses these squeezes in "Interactions between cash and derivatives bond markets: some evidence for the euro area" in "The changing shape of fixed income markets", *BIS Papers No 8*, forthcoming.

turn the different securities into equivalent assets. In the case of the bobl future, the deliverable securities are German government notes with maturities between 4.5 and 5.5 years. To adjust for differences in coupons and maturities, the prices of these bonds are multiplied by a conversion factor based on a valuation of coupons and principal at an annual yield of 6% for all payment dates. However, because this adjustment is imperfect, one of the securities will always turn out to be cheapest to deliver, depending on the level of market interest rates and the slope of the yield curve. Low interest rates relative to the notional coupon would tend to favour delivery of a high-coupon and short-maturity security.

Squeezes are more likely if the supply of the CTD is small, if the choice of CTD is highly predictable and if its rotation to other deliverable securities is prevented by a lack of issues with fairly similar price sensitivities. Indeed, in previous squeezes involving the bund contract, the deliverable basket was composed of a small number of securities with widely different duration characteristics, which reduced the probability of a switch in the CTD. The bias in the conversion factor also made it easy for market participants to predict which security would be the CTD, and thus to target it for a squeeze, while the small size of the CTD encouraged them to squeeze the contract.

Market circumstances in February 2001 appear to have provided a good opportunity for a squeeze. The CTD was the 6.5% note maturing in October 2005. Open interest in the bobl future rose to over 565,000 contracts by 22 February, amounting to a notional amount of €57 billion. This was over five times the stock of CTD notes and about one and a half times the total size of the deliverable basket. By contrast, the December and September 2000 contracts had respectively only 384,000 and 281,000 futures outstanding two weeks before expiry. The graph on the previous page provides an illustration of market conditions prior to expiry of the March 2001 contract and compares them with those prevailing on previous expiry dates. It shows that the increase in open interest of the March 2001 was unusually large. That build-up also happened to coincide with a relatively small amount of the CTD note. Moreover, the next CTD, the 6% note maturing in January 2006, would have been significantly more expensive to deliver.

A small number of European banks apparently took this as an opportunity to corner the CTD note. With these banks buying large amounts of the note, short sellers found that when they tried to offset their positions, the price of the contract rose sharply. Indeed, the implied futures yield fell by almost 30 basis points in the two-week period before expiry. By the final day of trading, on 8 March, a participant who had shorted the contract at the peak of open interest would have lost 17 basis points of the implied yield of the futures contract.

The experience with the March 2001 contract has apparently led traders to adopt a defensive attitude. Hoarding of the deliverable securities on the next maturing bobl contracts (June and September) has been reported, which could have negative consequences for market liquidity. The reluctance of traders to take short positions on German government bonds could also depress the yield on deliverable securities relative to other securities.

These problems could become more acute if reduced German budget deficits resulted in a smaller basket of deliverable securities, with significant differences in coupons and maturities. However, the German government has begun to concentrate issuance in a narrower range of benchmarks. A higher volume of issuance of two-year, five-year and 10-year bonds should help increase the amount of underlying securities for Eurex contracts.

For its part, Eurex announced in early June the introduction of position limits on the open interest of single market participants and lower penalties for failure to deliver. Market participants had suggested a number of other measures, including a widening of the basket of deliverable securities to other European government bonds, cash settlement and an extension of the physical delivery period. Steps to improve the functioning of the repo market have also been proposed. A more efficient repo market would allow more effective arbitrage between the cash and futures markets, making squeezes more difficult to carry out.

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

Amounts outstanding, in billions of US dollars

	Notional amounts				Gross market values			
	End-June	End-Dec	End-June	End-Dec	End-June	End-Dec	End-June	End-Dec
	1999		2000		1999		2000	
Grand total	81,458	88,201	94,008	95,199	2,628	2,813	2,572	3,180
A. Foreign exchange contracts	14,899	14,344	15,494	15,666	582	662	578	849
Outright forwards and forex swaps	9,541	9,593	10,504	10,134	329	352	283	469
Currency swaps	2,350	2,444	2,605	3,194	192	250	239	313
Options	3,009	2,307	2,385	2,338	61	60	55	67
B. Interest rate contracts[2]	54,072	60,091	64,125	64,668	1,357	1,304	1,230	1,426
FRAs	7,137	6,775	6,771	6,423	12	12	13	12
Swaps	38,372	43,936	47,993	48,768	1,222	1,150	1,072	1,260
Options	8,562	9,380	9,361	9,476	123	141	145	154
C. Equity-linked contracts	1,511	1,809	1,645	1,891	244	359	293	289
Forwards and swaps	198	283	340	335	52	71	62	61
Options	1,313	1,527	1,306	1,555	193	288	231	229
D. Commodity contracts[3]	441	548	584	662	44	59	80	133
Gold	189	243	261	218	23	23	19	17
Other	252	305	323	445	22	37	61	116
Forwards and swaps	127	163	168	248	..	..	..	..
Options	125	143	155	196	..	..	..	..
E. Other[4]	10,536	11,408	12,159	12,313	400	429	392	483
Gross credit exposure[5]					1,119	1,023	937	1,080
Memo: *Exchange-traded contracts*[6]	*15,501*	*13,522*	*13,918*	*14,302*	.	.	.	.

[1] All figures are adjusted for double-counting. Notional amounts outstanding have been adjusted by halving positions vis-à-vis other reporting dealers. Gross market values have been calculated as the sum of the total gross positive market value of contracts and the absolute value of the gross negative market value of contracts with non-reporting counterparties. [2] Single-currency contracts only. [3] Adjustments for double-counting estimated. [4] Estimated positions of non-regular reporting institutions. [5] Gross market values after taking into account legally enforceable bilateral netting agreements. [6] Sources: FOW TRADEdata; Futures Industry Association; various futures and options exchanges. Table 4.1

highlighting. First, there was an actual decline in the stock of contracts that tend to be of short maturity (particularly outright forwards and forex swaps but also forward rate agreements (FRAs)). Second, interest rate swaps – the largest component of the OTC market – witnessed a particularly pronounced slowdown. Third, the stock of inter-dealer transactions declined in both interest rate and foreign exchange instruments.

Mergers may account for some of the slowdown

Consolidation in the financial industry may possibly have accounted for some of the slowdown in the aggregate numbers, since mergers and acquisitions between reporting entities result in a consolidation of bilateral transactions and, consequently, a reduction of outstanding contracts. The figures, however, do not reflect the impact of the merger of JP Morgan and Chase announced in September 2000, as the firms involved continued to publish separate accounts until the end of the reporting period.

The *interest rate segment* expanded by only 1% in the second half of 2000, to $64.7 trillion. While the stock of FRAs declined by 5% and that of options rose by 1%, the swap market grew by 2%, to $48.8 trillion. Two other developments also stand out in the area of interest rate instruments. First, contracts with a maturity of up to one year decreased by 7%, while longer-term instruments continued to expand at a healthy pace (about 5%). Second, euro-denominated contracts fell by 7%, while those denominated in US dollars maintained their rapid growth.

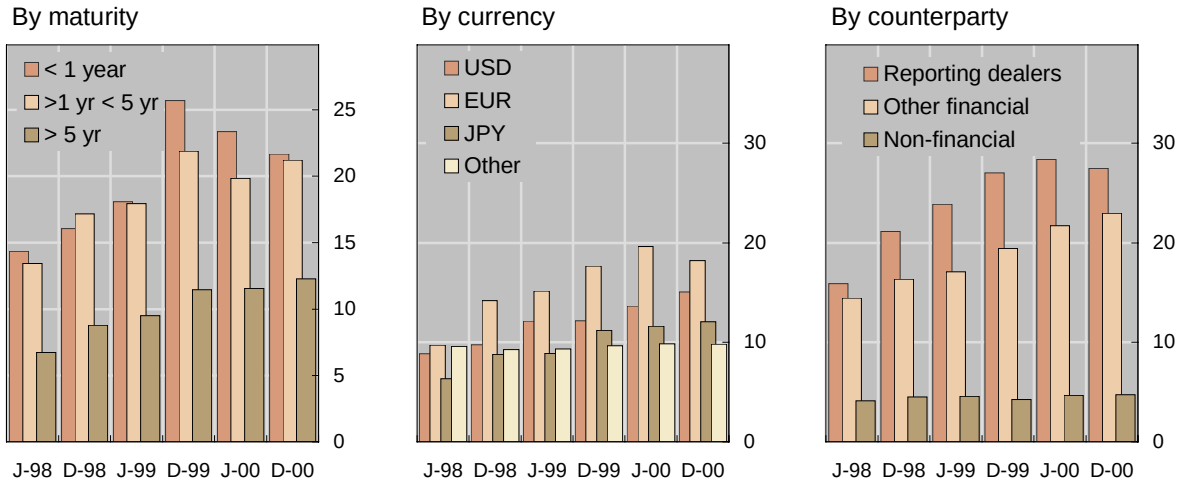
Euro-denominated interest rate swaps decline

In the specific case of the interest rate swap market, the deceleration in growth was in sharp contrast to the very rapid pace of business seen since the end of 1998. This slowdown resulted essentially from a 5% contraction of euro-denominated swaps. The decline in euro-denominated business was spread across the three types of counterparties, but the most significant drop occurred in the inter-dealer group. Various factors may have accounted for this development. These include financial sector consolidation, reduced issuance of certain types of "domestic" securities (such as Pfandbriefe, which are often hedged with swaps) and belated efforts by banks to clean up their pre-euro legacy currency portfolios.[7] By contrast, the stock of dollar-denominated swaps continued to grow at a sustained rate (10%). Net repayments of US government debt have affected the liquidity of the US government bond market and the effectiveness of traditional hedging vehicles, such as cash market securities or government bond futures. This has encouraged market

US dollar swaps continue to grow

Interest rate swaps and forward rate agreements

Notional amounts outstanding, in trillions of US dollars



Graph 4.4

[7] The transition to the euro allowed market participants to apply netting rules across contracts originally established in legacy currencies.

participants to switch to more effective hedging instruments, such as interest rate swaps.[8]

Most currency instruments slow down

In the area of *currency instruments*, the value of contracts outstanding rose by 1%, to $15.7 trillion, following a fairly strong increase in the previous reporting period. While the stock of outright forward and forex swap contracts fell by 4% and that of currency options declined by 2%, currency swaps grew by 23%. Instruments involving the US dollar and the euro expanded slightly but this was partly offset by declines in contracts involving the yen. This seems to be consistent with the pattern of implied volatility observed in the second half of 2000, whereby the volatility of the dollar/yen pair dropped sharply, while that of the dollar/euro remained high.

The lower value of outstandings in outright forwards, forex swaps and options may have reflected longer-term influences in the underlying spot market. Although new data on turnover and outstandings in the foreign exchange and derivatives markets will not be published by the BIS before the fourth quarter of 2001, anecdotal evidence suggests that interbank trading of currencies has declined in recent years. This could be due to a number of factors, including consolidation in the financial sector, the move to electronic broking and the paring-down of leveraged positions in the aftermath of the Asian and Russian financial crises.

Cross-currency swaps represent the main exception

The cross-currency swap market represented the main exception to the downward trend observed in foreign exchange instruments. This segment has expanded steadily since the BIS began collecting data on the OTC market. Business is likely to have been fuelled by the large volume of syndicated loans and securities issues, particularly those arranged for telecommunications firms. In contrast, the introduction by the US Financial Accounting Standards Board (FASB) of new rules on derivatives and hedge accounting for all publicly traded US companies with a fiscal year ending on 15 June 2000 does not seem to have had any contractionary effect.[9] In fact, the paring-down of positions by some companies in anticipation of the new rules might well have been offset by new business resulting from the replacement of complex hedges with simpler structures.

Activity in equity-linked contracts grows strongly

Activity in the *equity-linked sector* grew strongly, to $1.9 trillion, with all of the expansion taking place in the option segment. The second half of 2000 was a period of renewed uncertainty in global equity markets, with strong downward price pressures, particularly in technology stocks, leading to an upsurge in volatility. Business was most buoyant in options on European equities, such that this segment now accounts for nearly 60% of the stock of equity-linked

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[8] See the special feature by R N McCauley, "Benchmark tipping in the money and bond markets", in the March 2001 issue of the *BIS Quarterly Review*, pp 39-45.

[9] FASB Statement No 133 requires companies to record derivatives on their balance sheets as assets or liabilities that will be measured at fair value. Companies have to record in the income statement or in "Other comprehensive income" any changes in the value of such instruments designated as hedges that do not closely offset changes in the value of the underlying assets.

instruments. Although it may be too early to draw firm conclusions about longer-term trends, the increase in European option business in the second half of 2000 may also have been related to deeper underlying factors. One possible explanation may have been the greater popularity in Europe of equity-related investment products, such as stock investment funds, retail-targeted equity index products, convertible bonds and equity warrants.

Gross market values rise sharply

Estimated gross market values rose by 24% to $3.2 trillion, the most pronounced increase since the BIS began collecting data on the OTC market. Such an increase was somewhat unusual since the notional amount of outstanding contracts barely increased over the review period. As a result, the ratio of gross market values to notional amounts outstanding rose to 3.3% at end-December 2000 from 2.7% at end-June 2000, reversing a downward trend observed since the second half of 1998. As a percentage of notional amounts, the gross market value of foreign exchange contracts jumped to 5.4% from 3.7%, while that of interest rate contracts rose to 2.2% from 1.9%. One possible factor may have been a steady lengthening in the average maturity of interest rate and foreign exchange contracts.

Higher gross market values may result from longer maturities

Comparing data sources on the OTC derivatives market

Robert Scott

Interest in statistics on the global OTC derivatives market has been growing in line with the market's development. Several organisations regularly publish statistics on the total size and composition of the market. It is important for users to be aware of the key characteristics of each set of data. The semiannual and triennial surveys of activity in OTC derivatives markets, conducted by the G10 central banks and coordinated by the BIS, the ISDA survey and the Swaps Monitor survey all provide fairly comprehensive aggregates on the OTC market but have different methodologies and reporting populations. A brief discussion of these surveys follows.

Characteristics of OTC data

Data characteristics	**BIS**	**ISDA**	**Swaps Monitor**
Instrument coverage:			
Interest rate:	FRAs, swaps & options	Swaps & options	FRAs, swaps & options
Currency:	FX swaps, currency swaps, options	currency swaps	FX swaps, currency swaps, options
Equity:	Swaps, options	..	Swaps, options
Other:	Commodity	..	Commodity
Frequency	Semiannual	Semiannual	Semiannual
Reporting lag	4-5 months	5 months	5-6 months
Elimination of double-counting	Yes	No	Estimates only
Beginning of data collection	1998	1987	1992
Data sources	Reporting banks via G10 central banks	ISDA members	Published bank financial statements
Total contracts outstanding (June 2000)	$94 trillion	$60 trillion	$103 trillion
Of which: interest rate contracts (June 2000)	$64 trillion	$60 trillion	$79 trillion

The International Swaps and Derivatives Association (ISDA) survey

ISDA was the first organisation to publish data on the OTC derivatives market with a detailed survey introduced in 1987. In 1998, however, the detailed survey was discontinued and replaced by a semiannual "flash-survey" reporting only the total notional amounts outstanding of interest rate swaps, interest rate options and currency swaps outstanding. The survey is based on reporting of derivatives positions from ISDA members. The amounts outstanding from this survey have been very close in magnitude to those covered by the BIS survey for currency swaps and interest rate swaps and options. However, foreign exchange swaps, forward rate agreements and a number of other derivative products, such as equity and commodity derivatives, are not covered.

The Swaps Monitor survey

Using a methodology that is quite different from that of both the BIS and ISDA surveys, Swaps Monitor aggregates data based on disclosed positions in the financial statements of large dealers. These aggregates are of similar magnitudes to both the BIS and ISDA measures. Owing

to the lack of detail in financial statements, the instrument and counterparty breakdowns are estimated. The counterparty information is very important in this exercise since inter-dealer positions must be halved to avoid double-counting. Swaps Monitor owns the longest consistent time series on the OTC market. Coverage includes interest rate, currency, equity and commodity contracts.

The G10 central bank/BIS surveys

The semiannual survey of OTC derivatives markets provides worldwide consolidated data on the notional amounts and market values of the largest 60 dealers in the G10 countries. Detailed data are available by market risk category, contract type, maturity, currency and type of counterparty. The statistics include estimates of the activity by non-reporting dealers based on the BIS triennial survey, which is similar in structure, but much wider in scope, covering almost 50 countries. The data are adjusted for double-counting by halving positions between reporting dealers, which are reported separately in the statistics. G10 central banks and the BIS are the only providers of data on turnover in the OTC derivatives market. Currently, such data are collected as part of the triennial central bank survey of foreign exchange and derivatives market activity. The triennial central bank survey also provides global data on credit derivatives. With growing demand for information on activity in credit derivatives, central banks are now considering a more frequent collection of data in the context of the semiannual survey.