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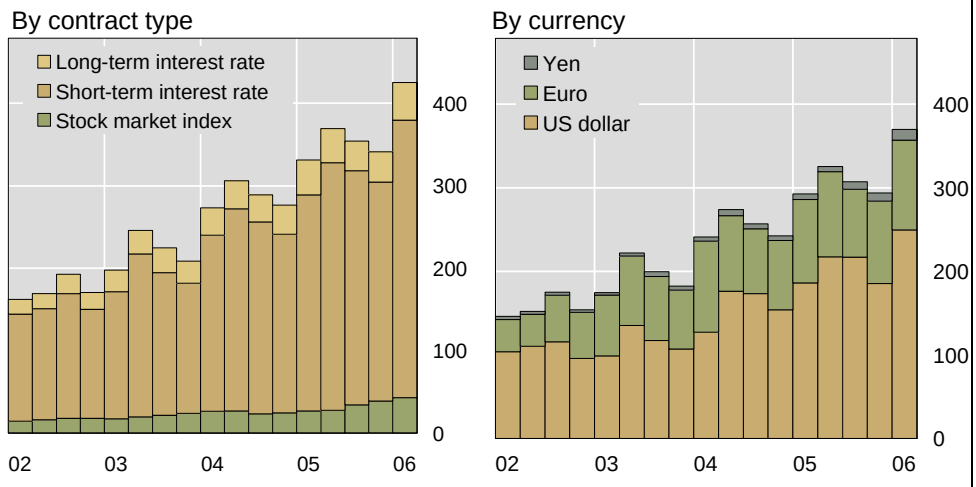
4. Derivatives markets

The pace of trading on the international derivatives exchanges quickened in the first quarter of 2006. Combined turnover measured in notional amounts of interest rate, equity index and currency contracts increased by one quarter to $429 trillion between January and March 2006 (Graph 4.1).[1] The year-on-year rate of growth rose to 28%, after 23% in the previous quarter, which indicates that the expansion in activity went considerably beyond the seasonal acceleration usually recorded in the first quarter.[2]

The increase in turnover was particularly strong in interest rate products (26%), as changing perceptions about the future course of monetary policy in the United States and Japan lifted activity in money market contracts in the dollar and yen. Turnover in derivatives on stock indices reached a record $43 trillion during January–March, up 11% from the previous three months.

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

[1] All growth rates refer to quarter-on-quarter changes, unless otherwise stated.

[2] For data on the volume of over-the-counter derivatives outstanding at end-2005, see the BIS semiannual central bank survey (http://www.bis.org/press/p060519a.htm).

However, the increase was entirely due to valuation effects stemming from higher equity prices. Volumes increased sharply in derivatives on energy and non-precious metals, and were stable at high levels in contracts on precious metals. Growth in the market for credit default swaps (CDSs) remained strong in the second half of 2005, although it was lower than in the preceding six months.

Surge in interest rate contracts

Turnover in interest rate contracts rises …

Changes in the outlook for monetary policy in the United States and Japan propelled trading in derivatives on short-term interest rates (Graph 4.2). This far outpaced the seasonal recovery usually recorded in the first quarter (see *BIS Quarterly Review*, March 2006, pp 45–6). At the long end of the yield curve, activity in derivatives on government bonds increased by approximately one quarter against the backdrop of rising yields in the major economies.

… as uncertainty about further Fed rate hikes increases

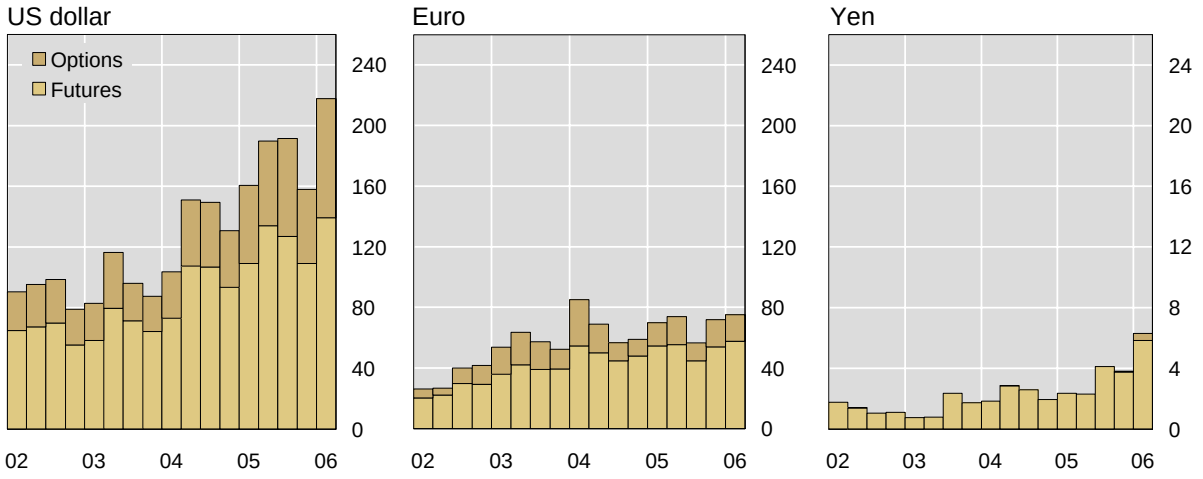
Uncertainty about Federal Reserve rate setting contributed to a 38% surge in trading in derivatives on short-term US interest rates. Turnover in futures and options on 30-day federal funds, which permit a more precise positioning on the timing of Fed decisions than the more heavily traded three-month eurodollar contracts, doubled to $36 trillion in the first quarter. Open interest in these contracts rose from $7 trillion at the end of 2005 to almost $12 trillion three months later. By contrast, trading volumes and open interest in derivatives on three-month eurodollar deposits went up by only one third to $166 trillion and $35 trillion respectively.

Prospect of rate increase boosts trading in yen contracts

The end of the policy of quantitative easing by the Bank of Japan and the prospect of the first rise in interest rates since 2001 led to a sharp increase in activity in money market contracts denominated in yen in February and March. Over the quarter as a whole, turnover in futures on three-month euroyen deposits rose by 55%, outpacing the growth in open interest (25%). This suggests that the increase in activity was at least in part related to more trading

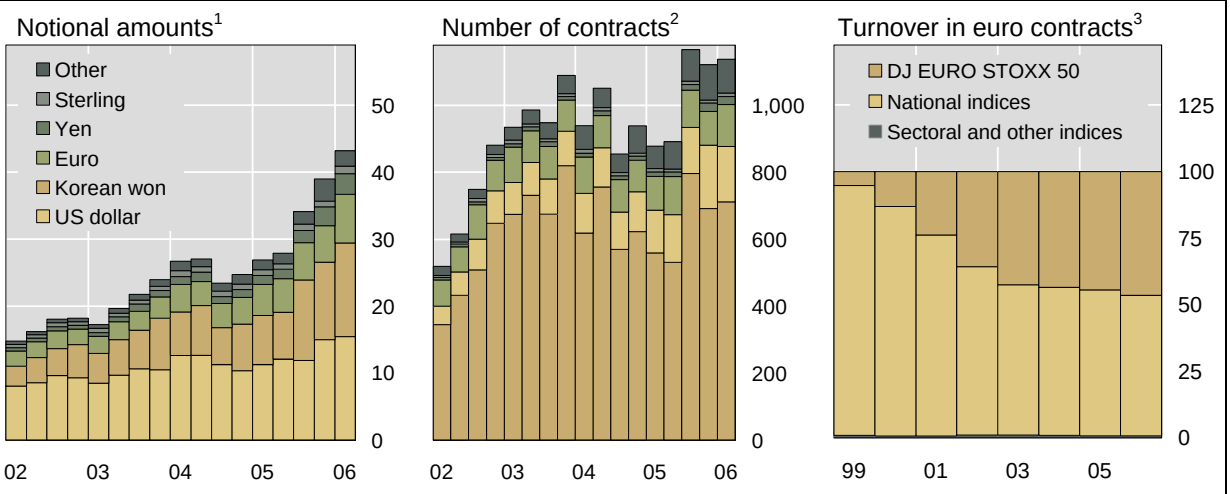
Turnover of short-term interest rate contracts

Quarterly contract turnover, in trillions of US dollars



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

Turnover of equity index contracts



[1] Quarterly turnover, in trillions of US dollars. [2] In millions. [3] In per cent; up to the first quarter of 2006.

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

on short-term price movements rather than long-term positioning or hedging. Trading in options on euroyen futures soared, expanding twelvefold, albeit from a low level.

The rise in trading in derivatives on short-term yen interest rates has to be viewed against the past evolution of that market. Turnover in three-month euroyen derivatives had peaked at $15 trillion in the first quarter of 1995 before declining to less than $1 trillion per quarter in the first half of 2003. This coincided with little trading in the cash market, as banks were able to obtain virtually any amount of liquidity directly from the Bank of Japan. Turnover recovered to $6 trillion in the first quarter of 2006, but remained well below the levels recorded a decade before.

Stable activity in derivatives on euro rates

The rapid increases in turnover of derivatives on short-term dollar and yen interest rates contrasted with more muted growth in euro-denominated contracts. Trading volumes in futures and options on three-month Euribor rose by 4% to $75 trillion in the first three months of 2006, roughly in line with the usual seasonal pattern. This came after busy trading in the previous quarter, which had seen the first rate hike by the ECB in two years.

Valuation effects drive turnover in equity index contracts

Rising stock prices drive up notional amounts of stock index derivatives

Turnover of stock index derivatives increased by 11% in terms of notional amounts to $43 trillion in the first three months of 2006, the highest level on record (Graph 4.3, left-hand panel). This was entirely due to valuation effects caused by rising stock prices; turnover measured by the number of contracts traded was almost unchanged from the previous quarter (Graph 4.3, centre panel).

The stagnation in worldwide activity hides substantial regional variations. Trading in futures and options on stock indices denominated in euros and sterling increased by approximately one third in dollar terms and by one quarter

in terms of the number of contracts traded, reflecting the extent to which these markets outperformed those of other developed economies.

Trading in other major markets was more subdued. Turnover in the dollar market stagnated at $15 trillion (down 12% in terms of the number of contracts). In Korea, turnover increased by almost one quarter in dollar terms but was nearly flat as regards the number of contracts traded. Trading in derivatives on Japanese indices rose by 6% in dollar and fell by 2% in physical terms.

Country indices remain dominant in euro area

Contracts on country-level indices continued to dominate trading in equity index derivatives in the euro area, although their share fell to just over one half in the first quarter of 2006 as contracts on area-wide indices, mainly the EURO STOXX 50, gained ground (Graph 4.3, right-hand panel). Derivatives on sectoral indices, by contrast, continued to play only a marginal role, accounting for less than 1 % of total turnover in stock index products in the euro area.

The discrepancy between country and sectoral indices is particularly noteworthy if one considers that sectoral effects had dominated country effects in the prices of euro area equities in the initial years of the euro (see *BIS Quarterly Review*, March 2001, pp 13–14). While the share of sector products is in line with that in the United States, the ongoing relevance of derivatives on stock indices of member countries suggests that country factors continue to play a significant role in asset allocation in the euro area.

Surge in energy derivatives on geopolitical concerns

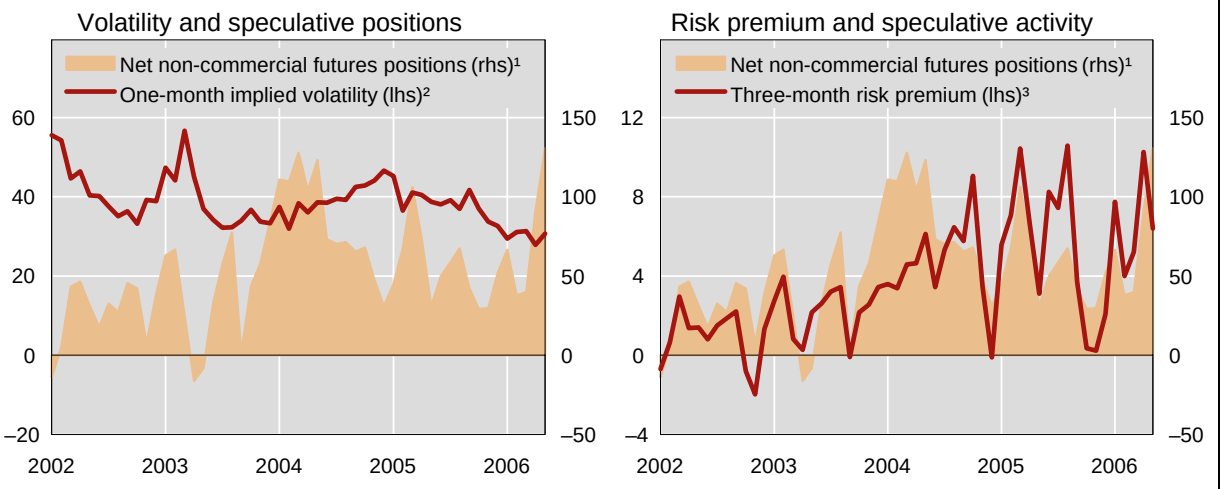
Soaring turnover in energy derivatives

Turnover in energy derivatives (measured by the number of contracts traded, since notional amounts are not available) expanded by almost 40% in the first quarter. The surge was mainly related to concerns about the impact of Iran's nuclear programme on oil markets as well as possible future bottlenecks in oil supply.

The increase in trading volumes was unevenly distributed across geographical regions. Trading was more active in North America and Europe, where volumes went up by 51% and 44% respectively, whereas turnover growth in other regions remained subdued. The rise in turnover coincided with an increase in open interest in energy futures and options by approximately 150% and 60% respectively. In the United States, data published by the US Commodity Futures Trading Commission (CFTC) showed that net long positions in futures and options on West Texas Intermediate crude oil by non-commercial users rose to 54,000 contracts at the end of March, from 24,000 in February. Buying pressure in oil futures was reflected in a substantial rise in risk premia in March (Graph 4.4, right-hand panel).[3] Such premia are calculated as the difference between futures prices and the consensus forecasts for spot prices at expiry of the respective contracts, and compensate the marginal investor for the risk of adverse price movements. The rise in these

[3] For the estimation of the risk premia, see *BIS Quarterly Review*, December 2005, pp 50–51.

Risk premium and net non-commercial futures positions in oil derivatives



[1] In thousands of contracts of 1,000 barrels. [2] In per cent. [3] Three-month crude oil futures price less the consensus forecast for the price of West Texas Intermediate, in US dollars.

Sources: Bloomberg; Commodity Futures Trading Commission; © Consensus Economics; BIS calculations. Graph 4.4

premia to about $5 and $10 per barrel for three-month and 12-month contracts, respectively, could indicate that non-commercial users were willing to pay increasing amounts in order to obtain exposure to further rises in oil prices. It should be noted that high risk premia are not necessarily associated with high volatility. Indeed, implied volatility actually declined during the first quarter (Graph 4.4, left-hand panel), although it picked up more recently (see the Overview).

Buoyancy in derivatives on base metals …

… in contrast to stagnation in precious metals

Activity in non-precious metals continued the upward trend recorded in 2005. Trading volumes were remarkably robust in Asia, where turnover expanded by more than 30%. Trading volumes of futures contracts on precious metals, by contrast, decreased slightly during the first quarter, after a substantial expansion in previous periods, while options turnover increased by 30%. In the case of futures on gold, the slowing in activity may be explained by changes in the outlook for gold prices, which appeared to become more uncertain during the first three months of the year. In addition, the declining price of risk reversals suggests that traders now perceive the risks of large price movements in either direction to be more balanced than previously, when they viewed the balance of risks to be positive. Both uncertainty and the price of risk reversals tend to be associated with weaker turnover in futures but not in options (see box on the next page).

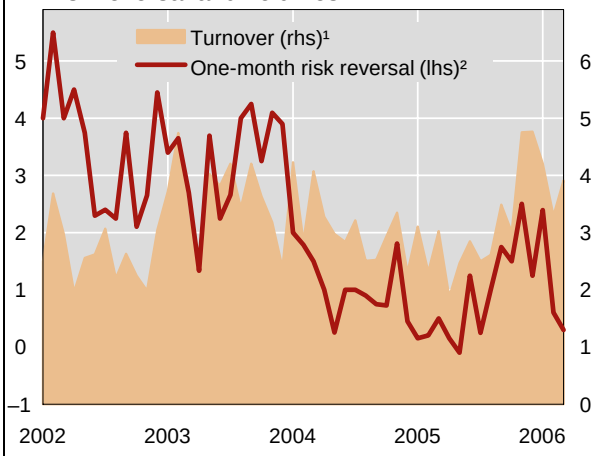
Market sentiment and trading in gold derivatives

Turnover in futures and options on gold traded on the international derivatives exchanges declined by 9% in the first quarter of 2006. This fall coincided with rising volatility, which goes against the conventional wisdom that high volatilities are associated with more trading. At the same time, the distribution of future gold prices appears to have become less skewed, suggesting that market participants no longer perceive the upward potential for gold prices to be larger than the downward risks (see left-hand panel of graph). This box relates turnover and open interest in gold derivatives to implied volatility and to the price of risk reversals. Both indicators are often used to measure market sentiment, although strictly speaking they reflect investors' attitudes to risk as well as their outlook for prices. A risk reversal consists of a simultaneous purchase of an out-of-the-money call option and sale of an equally out-of-the-money put option, and its price indicates whether traders consider risks to be concentrated on the upside or on the downside. The results of the analysis suggest that both implied volatility and the price of risk reversals tend to influence turnover in gold futures but have little explanatory power for options activity.

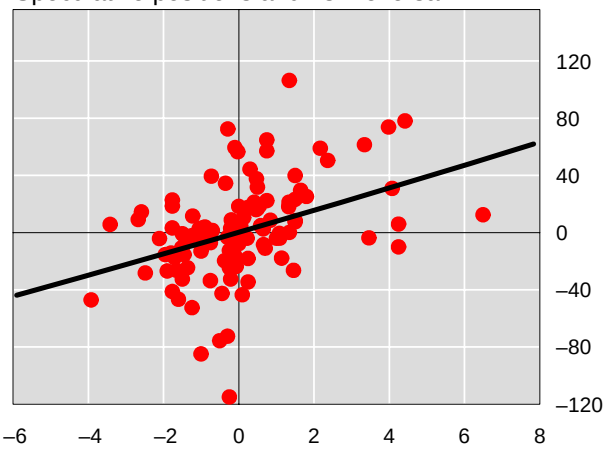
There is little agreement on the link between the outlook for gold prices and trading. On the one hand, high volatility may increase the demand for protection, thus resulting in more trading. On the other hand, high volatility may reduce turnover because it increases the risks from taking positions. A highly skewed distribution of future spot prices may raise demand from both hedgers and speculative traders, as it affects the balance between the compensation received for taking risks and potential losses if prices move against them (see also left-hand panel of graph). Alternatively, a high skewness may indicate that market participants are concentrated on one side of the market. In that case, positions that are at odds with the prevailing market sentiment may be handed from one trader to another ("hot potato trading"), which may result in high trading volumes.

Trading and market sentiment

Risk reversal and volumes



Speculative positions and risk reversal[3]



[1] In millions of contracts. [2] Difference between the 25% delta call and put option prices for contracts with a time to expiry of one month. [3] Changes in net positions of non-commercial investors against changes in the one-month risk reversal.

Sources: Commodity Futures Trading Commission; FOW TRADEdata; JPMorgan Chase; BIS calculations.

We test for the impact of market sentiment on activity in gold derivatives by regressing monthly changes in aggregate turnover and open interest on a constant, one lag of the activity measure, lagged uncertainty and a lagged measure for the skewness implied by option prices. Turnover is measured by the total number of contracts traded in each month on the New York Mercantile Exchange and the Tokyo Commodity Exchange, while open interest refers to the number of contracts outstanding at the end of each month. Uncertainty is proxied by implied volatility from at-the-money options, and skewness by the absolute price of risk reversals. Implied volatility and risk reversals were entered in the equation with the first lag in order to account for possible endogeneity between activity and the market sentiment indicators. The sample spans from January 2002 to March 2006, and the estimates are shown in the table.

Volatility, skewness and activity in gold derivatives			
	Implied volatility[1]	Risk reversal[2, 3]	Adjusted R-squared
Turnover			
Futures	–4.53 (0.9)***	9.47 (2.9)**	0.36
Options	–1.61 (1.5)	2.67 (4.4)	0.04
Open interest			
Futures	–0.85 (0.4)**	1.49 (1.2)	0.04
Options	1.47 (0.9)	2.72 (3.3)	0.24

Note: Standard errors corrected for heteroskedasticity and serial correlation using the Newey-West method are shown in parentheses. *, ** and *** denote a coefficient statistically different from zero at the 10%, 5% and 1% confidence levels respectively. The estimation period is January 2002–March 2006.

[1] Calculated from the prices of at-the-money options with a time to expiry of one month. [2] The difference between out-of-the-money call and put option prices for contracts with a 25% delta. [3] In absolute values.

Sources: FOW TRADEdata; JPMorgan Chase; BIS calculations.

There appears to be a negative and statistically significant relationship between activity in gold futures and uncertainty, which is consistent with the result in Jeanneau and Micu (2003) for equity contracts.[①] By contrast, neither implied volatility nor risk reversals seem to affect option turnover in any significant way. This may be explained by the fact that the market for gold options is much less liquid than that for futures, which is also reflected in a more erratic behaviour of turnover. Open positions in futures are negatively related to uncertainty, while the relationship is not statistically significant in the case of options.

Turning to risk reversals, asymmetry of the future distribution of the gold price is associated with a significantly higher turnover in futures but not in options. This may be caused by high hedging demand or by "hot potato trading", although the fact that the price of risk reversals does not affect open interest in any statistically significant manner may suggest that the latter explanation may be more relevant.

[①] S Jeanneau and M Micu, "Volatility and derivatives turnover: a tenuous relationship", *BIS Quarterly Review*, March 2003, pp 57–65.

Slowing growth in credit default swap market

Buoyant activity in the CDS market

Growth in the market for credit default swaps (CDSs) remained vigorous in the second half of 2005, although it was lower than in the preceding six months. The notional amount of CDSs increased by one third to $14 trillion at the end of 2005, after a 60% rise in the previous period.[4] With credit spreads little changed, gross market values of CDSs increased by 31%, roughly in line with the rise in notional amounts.

Growth in single-name CDSs (40%) outpaced activity in multi-name contracts (21%), thus reversing the pattern recorded in the first half of 2005, when outstanding amounts of multi-name contracts had more than doubled. At the end of the year, notional amounts of single-name and multi-name CDSs stood at $10.2 trillion and $3.5 trillion respectively.

[4] The total notional amount outstanding is calculated as the sum of contracts bought and sold minus half of the sum of contracts bought and sold between reporting dealers.

Delphi bankruptcy revealed flaws in settlement process

Although the period between July and December 2005 saw a number of high-profile defaults, this did not have a notable *direct* effect on the volume of CDSs outstanding. Single-name CDSs expire after a credit event, but the volume of CDSs on any defaulting firm was too small to reduce the notional amounts of outstanding contracts significantly. None of the firms that defaulted during the second half of 2005 had featured among the top 25 reference entities during the previous year listed in the 2004 survey of credit derivatives by FitchRatings. The notional amount of *all* credit derivatives (not just CDSs) on Delphi, for example, was estimated to be just under $30 billion, less than one third of a percentage point of the notional amount of all CDSs, even though Delphi's bankruptcy was considered to be the most significant credit event of the period.

While the direct effects of the bankruptcies of Delphi and other firms were negligible, it is possible that fears of shortages of the debt available for delivery may have deterred some trading. Under certain circumstances, a shortage of deliverable debt can drive up the price of such paper beyond the level that might otherwise be justified by the expected size of repayment. In the case of Delphi, the settlement price of 63.5% (and an average CDS recovery price of 53.5%) was considerably higher than the settlement prices of other firms from the same sector or than rating agencies' estimates of the ultimate recovery rates on Delphi's debt.

Derivatives on recovery risk

The Delphi auction underlined the importance of recovery risk for pricing CDSs. Several products have emerged that permit investors to trade this risk separately from default risk (see box). The prices of such products could provide a benchmark against which deliverables could be priced following a credit event, perhaps leading to a more efficient settlement process.

Increased role of cash settlement

The fact that CDSs are usually settled by delivering debt of the reference entity rather than by cash can be explained by the historical evolution of this market. It started as a type of "insurance" against default but later evolved into a trading market, which is used to take trading positions as well as to hedge existing exposures. Following major credit events, it has become the norm to shift from physical delivery to cash settlement of multi-name contracts on an ad hoc basis, where the settlement price is determined in an auction of the reference entity's debt. While an industry initiative stipulating cash settlement for *index* contracts is under way, it is not yet clear how potential shortages of deliverables will be resolved for *single-name* CDSs, to which ad hoc protocols generally do not apply. Any solution to this problem may be hampered by conflicts of interest between traders, who probably prefer cash settlement, and investors with cash exposures to the reference entity, who prefer physical delivery.

Reduced confirmation backlogs

A shortcoming of the market concerns the large backlog in trade confirmations.[5] While there are signs that this problem is being addressed, it has not yet been fully solved. According to market sources, all major

[5] See *BIS Quarterly Review*, December 2005, pp 52–3.

Recovery rate products

Fixed recovery CDSs

In a standard CDS contract, the protection seller is exposed to recovery rate risk upon default of the reference entity in the contract. A fixed recovery CDS eliminates the uncertainty on the recovery rate by fixing a specific recovery value for the CDS contract. In the event of the reference entity's default, the protection seller makes a cash settlement equal to 100 minus the contract's fixed recovery rate. If the fixed recovery rate is set to zero, the instrument is referred to as a zero recovery CDS.

Recovery locks

A recovery lock is a forward contract that fixes the recovery rate irrespective of what the secondary market price for the bond is. A recovery lock is documented as a single trade.

Recovery swaps or digital default swaps

In practice, a recovery lock can be structured using two separate trades: a fixed recovery CDS and a plain vanilla CDS. For example, the purchase of a recovery lock at 44% can be seen as two separate transactions, the first one selling protection on a standard CDS, and the second one buying protection through a fixed recovery CDS on the same reference entity at 44%. If the CDS spreads for both transactions happen to be identical, then the premium payments on the transactions will net to zero. If the reference entity defaults, the recovery buyer will take delivery of the defaulted debt and pay 44% of the face value of the bond to the counterparty in the transaction. If the premium payments are not identical for the two transactions, the notional amount for which the recovery is purchased can be adjusted to ensure that there are no interim cash flows in the absence of the reference entity's default. The paired transaction described here is referred to as a recovery swap or digital default swap. A recovery swap, unlike a recovery lock, is documented as two separate trades.

institutions trading CDSs now adhere to the 2005 ISDA Novation Protocol, which stipulates that trades cannot be transferred without the prior consent of all parties. This has eliminated one major cause of the confirmation backlogs, namely the assignment (transfer) of trades without notification. Dealers have also dedicated more resources to back office operations. According to a letter from 14 major dealers to the Federal Reserve Bank of New York and other supervisory authorities, the number of trades without confirmation after 30 days had fallen by more than half by the end of January 2006. In addition, dealers confirmed their commitment to a total reduction of 70% by the end of September. A decline in confirmation times is also recorded by the 2006 Operations Benchmarking Survey of the International Swaps and Derivatives Association (ISDA). Progress seems to have also been made in moving to electronic confirmation. Going forward, it is important that these efforts continue in order to reduce the uncertainty about the extent of risk transfer that is associated with unconfirmed trades.

CDS data show limited risk transfer outside the banking system

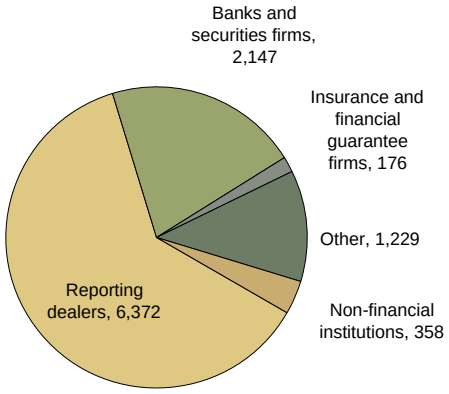
Improved counterparty breakdown of CDS statistics …

The most recent release of the BIS CDS statistics provides a finer breakdown of the counterparties of the reporting dealers than previously available. All countries now report exposures to insurance companies as well as banks and securities dealers, previously subsumed under the "other financial institutions" category.

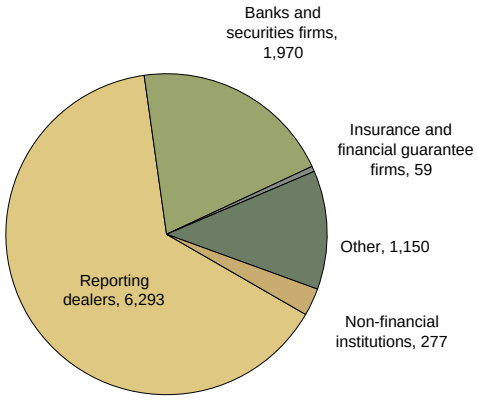
Participants in the CDS market

At end-December 2005, in billions of US dollars

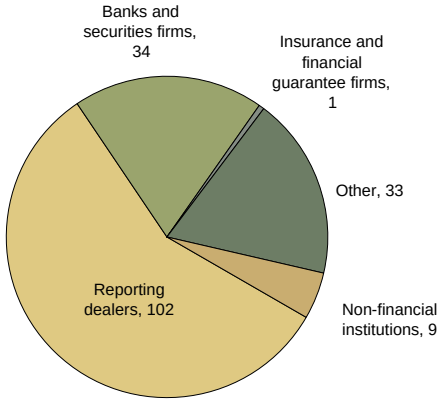
Notional amounts outstanding bought



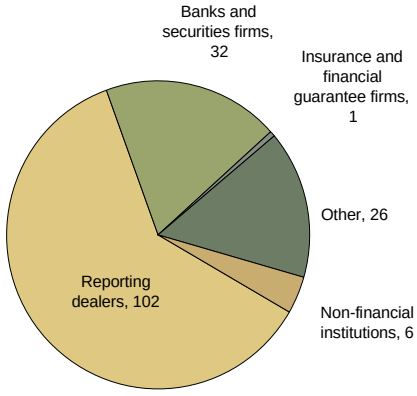
Notional amounts outstanding sold



Gross positive market values



Gross negative market values



Source: BIS.

Graph 4.5

… shows that CDSs are still largely an interbank market

The data confirm the impression that the CDS market, like most other over-the-counter markets, is largely an interbank market. At end-2005, two thirds of all outstanding positions were between reporting dealers, and a further quarter were between reporting dealers and other banks or securities firms. By contrast, only 3% of the transactions were with non-financial institutions. Insurance and financial guarantee firms accounted for $180 billion (roughly 2%) of protection bought, and $60 billion (less than 1%) of protection sold by reporting dealers. Finally, 11% of all trades were with "other residual financial institutions", a category that includes mutual funds, hedge funds, special purpose vehicles and other players. The figures do not vary substantially whether one looks at single-name or multi-name contracts. The sole exception is insurance firms, which tend to hold basket contracts rather than single-name CDSs.

Notional amounts can be used to relate the size of derivatives markets to the underlying, but they do not provide a good measure of actual risk exposures. However, looking at gross market values, which capture the cost of replacing contracts at a given point in time, leaves the picture broadly unchanged. Again, the main exception is insurance companies, whose share in

the CDS market drops by a factor of four to 0.5% of the total gross market value. A possible explanation would be that insurance corporations tend to invest mainly in the more senior tranches of index contracts whose spreads are less volatile over time. As CDSs by construction have a zero cost at inception, less volatile tranches will tend to have replacement costs closer to zero than lower-rated tranches.

While it is possible that the aggregate figures supplied to the BIS mask some sizeable individual exposures, they do not support a picture in which insurance companies purchase CDSs to take on credit risk on a large scale. Nonetheless, a transfer of credit risk from the banking to the insurance sector may still be taking place through other instruments. According to a survey by FitchRatings, the use of credit derivatives by North American, albeit not European or Asian, insurers in 2004 was geared towards collateralised debt obligations, which offer a high spread relative to the rating category. Insurance companies may also use credit-linked notes, loan sales, asset-backed securities or more traditional credit insurance in order to take over risk from the banking sector.[6]

[6] For a review of the different instruments for transferring risk, see D Rule, "Risk transfer between banks, insurance companies and capital markets: an overview", Bank of England, *Financial Stability Review,* December 2001.