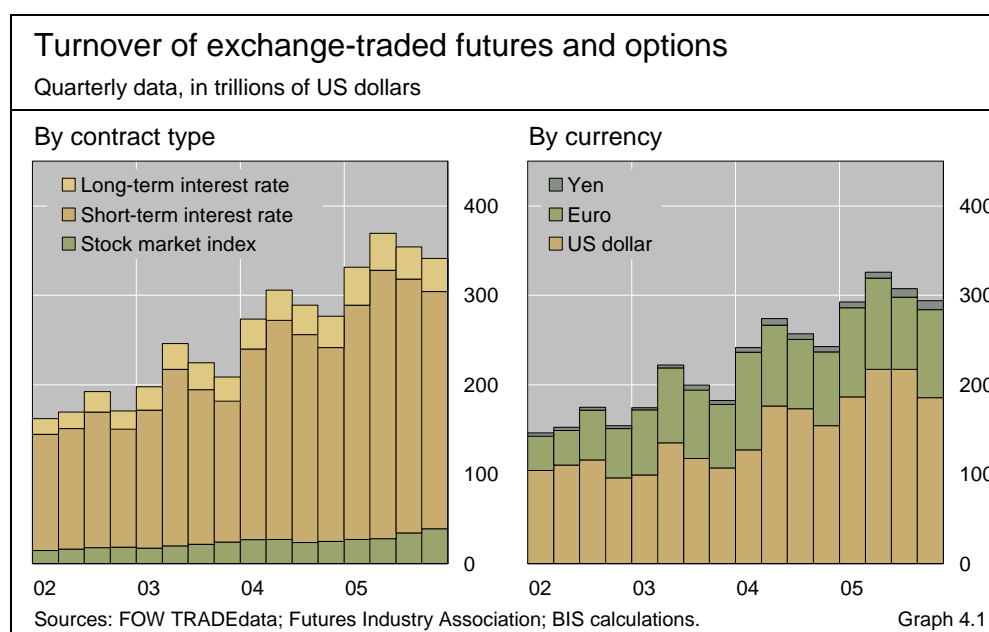


4. Derivatives markets

Trading on the international derivatives exchanges declined during the fourth quarter of 2005. Combined turnover (measured by notional amounts) in fixed income, equity index and currency contracts fell by 4% quarter-on-quarter to \$344 trillion (Graph 4.1). As in the previous quarter, this was mainly due to seasonal factors, which tend to depress activity in the interest rate segment towards the end of the year. The year-on-year rate of growth remained unchanged at 22%.

In the interest rate segment, solid growth in turnover of derivatives on short-term euro interest rates ahead of the ECB's policy rate hike on 1 December 2005 partly compensated for weaker activity in the US and Japanese markets. Turnover in stock index contracts rose by 14% quarter-on-quarter to a record \$39 trillion, with growth being concentrated in contracts on Japanese and US stock indices. The volume of exchange-traded currency contracts increased by 8% to \$3.3 trillion. Trading in commodity derivatives increased slightly during the final quarter of 2005, as a large rise in the turnover of contracts on precious metals was offset by reduced activity in energy derivatives.



ECB tightening lifts trading in Euribor contracts

Trading in the interest rate segment on the international derivatives exchanges declined by 6% quarter-on-quarter, but this was entirely due to seasonal factors, whose pattern is examined in more detail in the box on page 45.

Trading volumes of futures and options on short-term interest rates were uneven across the major markets. Turnover in contracts on euro money market rates rose by 28% to \$72 trillion, whereas volumes in dollar- and yen-denominated contracts fell by 18% and 8%, respectively (Graph 4.2). Even so, with a turnover of \$158 trillion, the dollar segment still remains more than twice as large as that of the euro. Trading in derivatives on short-term Japanese rates amounted to \$4 trillion, well behind turnover in contracts on sterling rates (\$22 trillion).

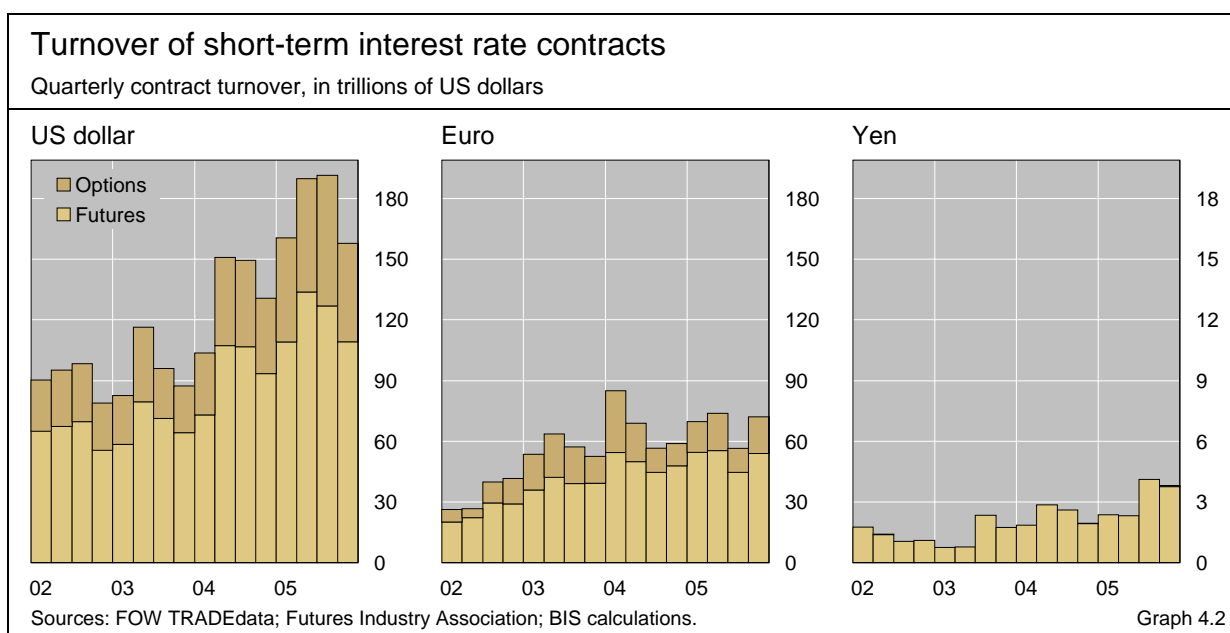
Activity in futures and options on three-month Euribor traded on Euronext.liffe soared as signs of strengthening economic activity in the euro area led market participants to revise their expectations of future short-term interest rates. While a rate hike by the ECB had seemed far off in early October, it appeared more likely as new data came in. The shift in expectations did not coincide with a marked increase in uncertainty, as is shown by the relatively mild rise in implied volatility (Graph 4.3), but it did induce traders to readjust their positions. As a consequence, turnover in Euribor futures and options rose to \$27 trillion in October and \$29 trillion in November, although it fell short of the record turnover of \$32 trillion recorded in June.

Trading quickly tailed off after the ECB raised the minimum bid rate of its main refinancing operations to 2.25% on 1 December. The move had been fully anticipated, but there was less clarity about whether it was a one-off or the beginning of a gradual tightening cycle as in the United States during the previous year and a half. This uncertainty did not translate into higher trading volume than is usual in the final month of the year.

Seasonal decline in interest rate segment

Short-term interest rate derivatives

Outlook for policy rates boosts trading in the euro area ...



Seasonality in interest rate derivatives activity

Trading on the international derivatives exchanges is subject to seasonal fluctuations that complicate the interpretation of turnover and open interest. Such seasonal effects appear to be strongest in the interest rate segment, which in 2005 accounted for approximately 90% of both turnover and open interest (measured by notional amounts) of all financial derivatives. By contrast, they are statistically insignificant in the market for futures and options on stock indices. This box presents estimates of the seasonal factors affecting activity in exchange-traded interest rate derivatives that should facilitate the interpretation of the data published in the *BIS Quarterly Review*.

The analysis is based on the *X-12-ARIMA* approach developed by the US Census Bureau, which is widely used in statistical agencies across the world. This method decomposes a series in a sum of moving averages and autoregressive terms and accounts for trends, cycles and seasonal components.^① The estimations use quarterly data for the period 1993 Q4–2005 Q4.

Selected estimates of seasonal factors as a percentage of average total activity for each quarter are presented in the table. All factors are statistically significant and exhibit relatively similar seasonal patterns. Activity tends to be higher in the first half of the year, followed by a decline in the third and the fourth quarters. For short-term interest rate contracts, turnover peaks in the second quarter (6.8%), whereas for long-term interest rates the seasonal peak is reached in the first quarter (7%). The largest decline occurs in the last quarter for both short- (–12.2%) and long-term (–8.9%) interest rate contracts. Open interest reaches its seasonal peak in the first quarter for both short- and long-term contracts. The fourth quarter decline in derivatives activity may be related to an increase in investors' need for liquidity to meet year-end cash flow obligations or to reduced position-taking in order to "lock in" previous returns. In both cases, traders may reduce positions in derivatives.^② Similarly, the surge in activity in the first two quarters may be associated with an increasing demand for interest rate risk hedging as international issuance of bonds and notes peaks in these quarters.^③

Seasonal factors in interest rate derivatives activity¹

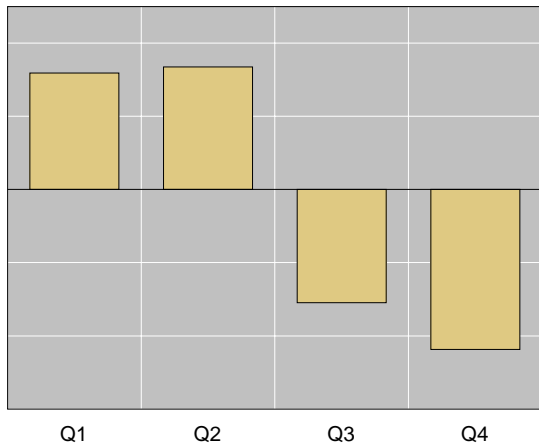
	Average seasonal factors								F-test for the presence of seasonality ²	
	Turnover				Open interest					
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Turnover	Open interest
Total short-term	3.1	6.8	0.7	–12.2	3.9	3.6	1.8	–10.6	15.5	14.1
By instrument										
Futures	2.1	7.1	0.6	–11.2	2.4	2.2	0.2	–5.2	18.2	10.8
Options	4.3	5.9	1.2	–13.6	–0.9	7.8	4.3	–13.4	8.9	13.3
Total long-term	7.0	2.9	–2.1	–8.9	6.2	1.9	2.3	–12.9	17.1	19.4
By instrument										
Futures	7.3	2.4	–1.9	–8.9	4.3	0.1	2.2	–7.6	18.9	10.6
Options	6.0	5.5	–4.2	–9.2	10.9	6.0	0.8	–24.4	7.9	13.6

¹ Additive factors as a percentage of average activity for each quarter. The sample period is 1993 Q4–2005 Q4. ² F-tests show statistically significant seasonality at the 0.1% level for all cases.

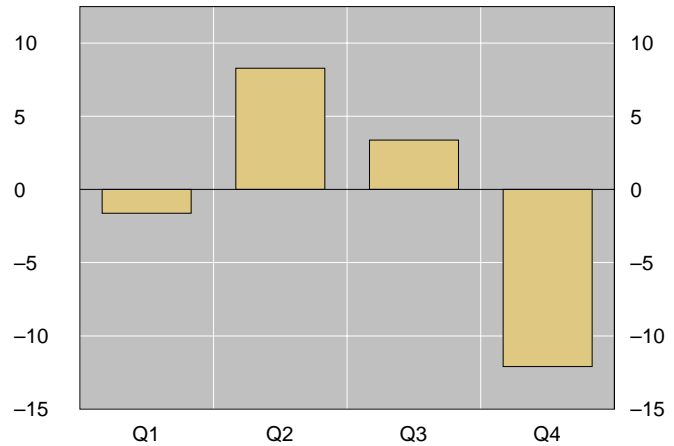
① For a detailed documentation of this method, see US Census Bureau, *X-12-ARIMA Reference Manual*, Final Version 0.3 (Beta), Washington DC, January 2006. ② See M D Griffiths and D B Winters, "The turn of the year in money markets: tests of the risk-shifting window dressing and preferred habitat hypothesis", *Journal of Business*, vol 78, no 4, 2005, pp 1337–63. ③ See J D Amato and J Sobrun, "Seasonality in international bond and note issuance", *BIS Quarterly Review*, September 2005, pp 36–39.

Seasonal factors in short-term interest rate derivatives turnover¹

Euro



US dollar



¹ Additive factors as a percentage of average turnover for each quarter. The sample period is 1993 Q4–2005 Q4.

Graph A

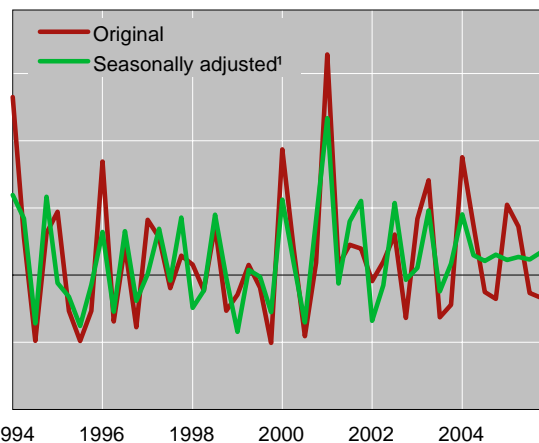
There are some noticeable differences in the seasonal patterns across currencies, in particular in the first half of the year. For example, the turnover of derivatives on short-term US dollar interest rates tends to be higher in the second and the third quarter, while turnover in euro contracts peaks during the first two quarters (see Graph A). The pattern for Japanese contracts is not statistically significant. These differences may possibly be determined by differences in issuance calendars of corporate and government securities.

The influence of seasonal factors on turnover in short- and long-term derivatives contracts is presented in Graph B. The figures show that some of the sharp swings in activity may be due to seasonal effects. These findings suggest that quarter-on-quarter changes in interest rate derivatives should be interpreted with care, by distinguishing between movements in the trend and the seasonal component.

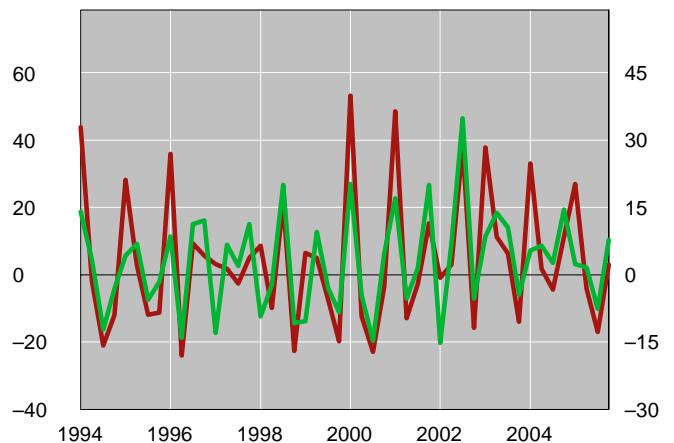
Seasonally adjusted interest rate derivatives turnover

Quarterly changes, in per cent

Short-term



Long-term



¹ Using the US Census Bureau's *X-12-ARIMA* procedure with additive factors.

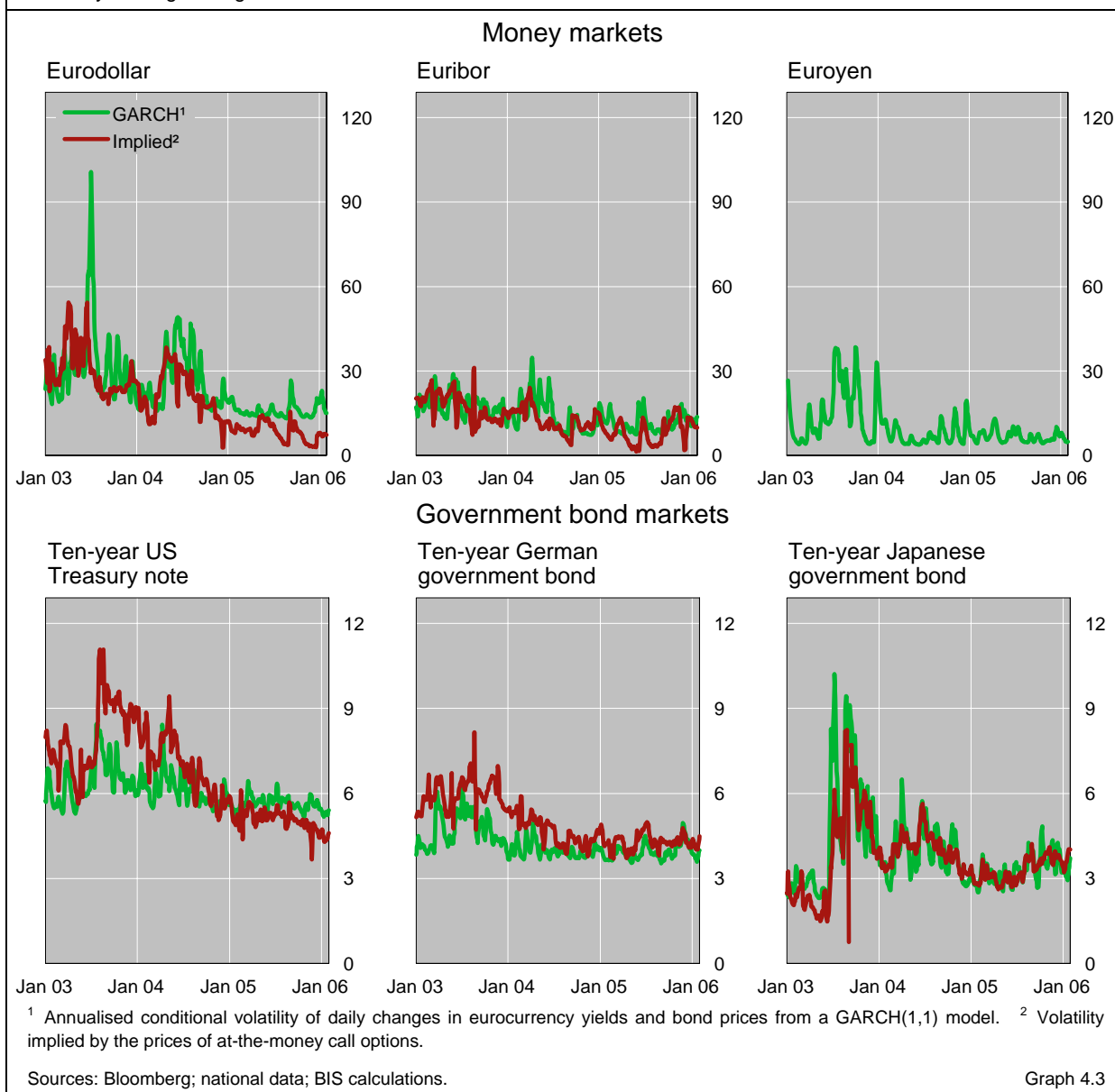
Graph B

In the United States, the Federal Reserve maintained its policy of stepwise tightening as it became clear that economic activity had emerged relatively unscathed from the fallout of Hurricane Katrina. While the rate increases at the FOMC's November and December meetings were fully anticipated, there was much less certainty about the level of interest rates at which tightening would

... and the United States ...

Volatility of major fixed income rates

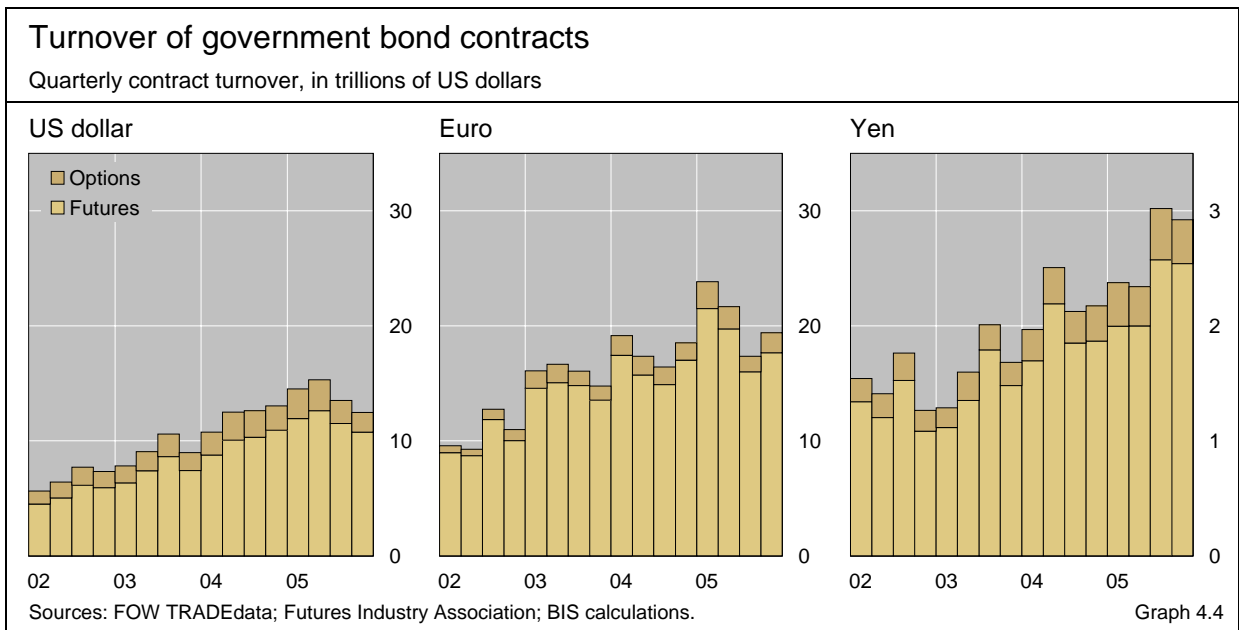
Five-day moving averages



end. This was reflected in solid turnover of \$43 trillion, after an exceptional \$73 trillion in the previous quarter.

... but not Japan

In Japan, the scenario of an early rate hike appeared more remote in the light of divergent opinions about whether deflationary forces were ebbing enough to allow consideration of an end to the policy of quantitative easing. Towards the end of the year, the view prevailed among market participants that quantitative easing would not be abandoned until the second half of 2006 and that interest rates might remain low for an even longer period. Thereafter, the anticipated time of a policy shift moved forward, but this did not affect trading in the fourth quarter of 2005. In the absence of a prospective rate increase, trading in contracts on three-month euroyen fell back to \$1.4 trillion in October (after \$1.6 trillion in September) and weakened further later in the year.



Activity in futures and options on government bonds remained stable at \$37 trillion in the fourth quarter (Graph 4.4). Turnover rose by 12% in the euro area, mainly reflecting increased activity in the two-year schatz and the five-year bobl contracts. In the United States, turnover declined by 8%.

Government bond contracts

Solid growth in stock index derivatives

Trading volumes in derivatives on stock indices rose to an all-time high of \$39 trillion in the last quarter of 2005, 14% above the level reached during the previous three months.

Equity index derivatives at record high

The growth in activity was particularly strong in Japan, where turnover in the fourth quarter exceeded the level of the previous period by 59%. The increase was concentrated on a few days in early December, as a five-year high of the Nikkei added to investors' concerns about the sustainability of the valuations of Japanese firms. Turnover remained high as equity prices dropped in the wake of a trading error on 8 December, but quickly tailed off towards the middle of the month.

Trading in US stock index derivatives rebounded by 26% in the final quarter of 2005 despite languishing stock prices. The US market thus regained its long-held position as the world's largest market for this type of product, which had been taken over by Korea in the third quarter (see *BIS Quarterly Review*, December 2005).

US market recovers top position ...

Trading in stock index derivatives remained flat in the other main markets. In Korea, turnover in KOSPI 200 futures and options stalled at \$12 trillion, as valuation gains offset a 13% decline in the number of contracts traded. Turnover in index derivatives on euro area stocks also stagnated (at around \$5½ trillion), even though European equities outperformed stocks in the United States.

... as activity in Korea remains flat

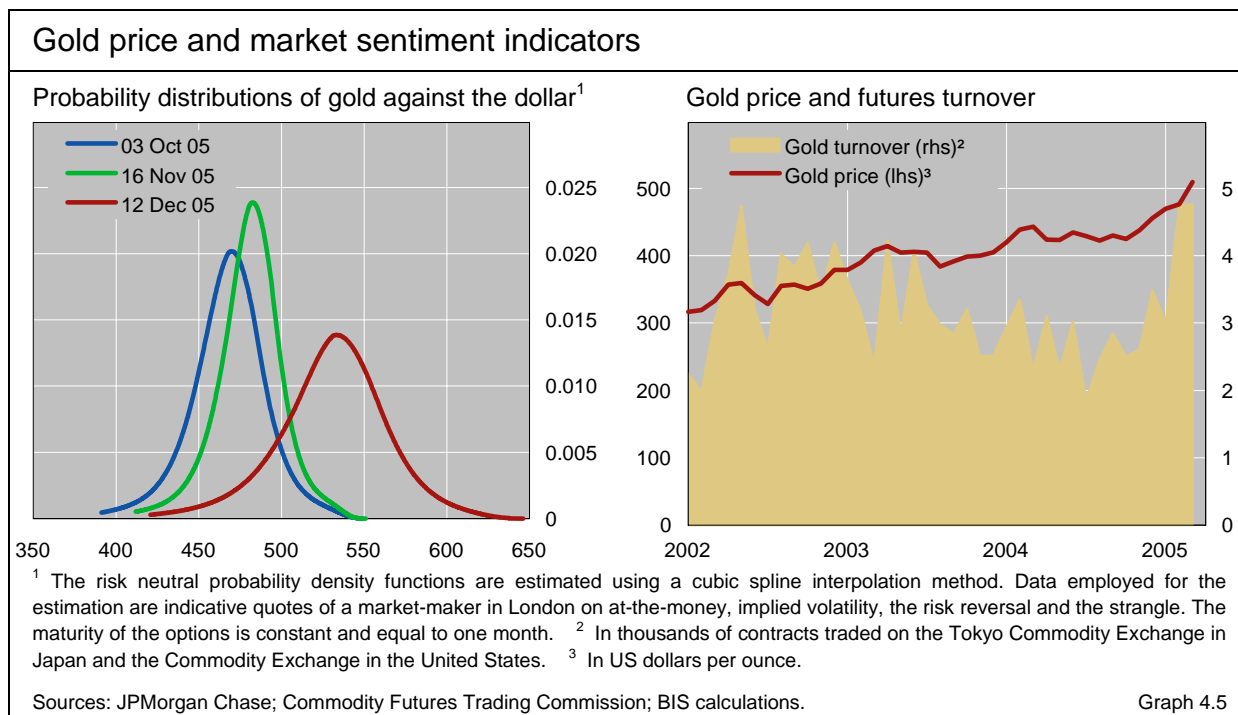
Japanese demand for gold drives activity in commodity markets

The number of commodity contracts traded on the international derivatives exchanges (data on notional amounts are not available) increased in the last quarter of 2005 by about 4%, driven mainly by a 47% rise in futures and options on precious metals. Turnover in contracts on non-precious metals and agricultural commodities rose by 7% and 6% respectively. The only exception to the general trend was energy derivatives (-11%), where activity reverted to normal levels after having been lifted to unusual highs by hurricane-related damage to US oil infrastructure.

Surge in derivatives on precious metals

The soaring turnover in derivatives on precious metals reflected mainly active trading in Japan, where investors appear to have used precious metals futures to diversify their portfolios as the yen declined. Total turnover in gold futures traded on the Tokyo Commodity Exchange doubled in the fourth quarter, while activity in silver and platinum contracts increased by roughly one third each. Trading in derivatives on precious metals in the United States increased by a more moderate 10%. The rise in trading volume coincided with an upsurge in prices of precious metals and, towards the end of the quarter, a pickup in volatility (Graph 4.5). Turnover in gold futures on the Commodity Exchange in the United States fell by one third in December while activity in options continued to increase, presumably because traders tried to protect themselves as they became more concerned about the risks to gold prices. In Japan, by contrast, turnover in gold futures continued to rise in December.

The rapid increase in turnover in precious metals derivatives did not lead to a corresponding rise in positions. Open interest increased slightly in Asia but declined in the United States. This may suggest that investors traded mainly on short-term price movements but were relatively cautious about increasing their longer-term exposure to precious metals.



Activity in energy derivatives declined in the fourth quarter from the hurricane-related peak in the summer. The largest drop in activity was recorded in Asian markets (–13%), followed by North American (–12%) and European exchanges (–4%). Lower trading activity may have been driven by a downward reassessment of growth in global oil demand. The quiescence in derivatives markets for oil may also indicate smaller incentives for speculation on a bearish futures market and decreasing hedging demands as volatility declined. Nevertheless, in the second half of December, the downward trend in derivatives activity for energy markets seems to have been reversed as oil prices and the risk premium on crude oil futures picked up.

Normalisation in
energy derivatives