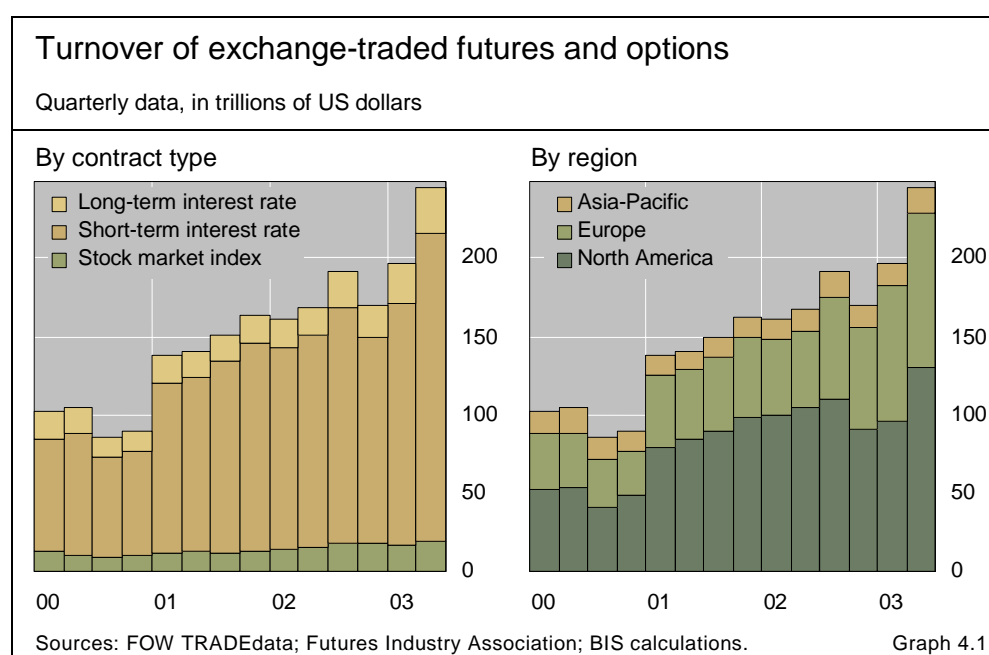


4. Derivatives markets

The aggregate turnover of exchange-traded financial derivatives contracts monitored by the BIS grew further in the second quarter of 2003. The combined value of trading in interest rate, stock index and currency contracts reached \$246 trillion, a 24% rise (Graph 4.1). Trading was buoyant across all major market risk groups, but activity was particularly brisk in interest rate contracts.

Much of the increase in fixed income business occurred on US exchanges and seemed to result from hedging activity related to future monetary policy actions and from duration readjustments by large intermediaries active in the US mortgage market. The backup in yields in the global bond market from late June had only a limited impact on overall market activity in July, with a notable increase in the trading of US government bond contracts but a decline in the turnover of fixed income instruments elsewhere.

Trading in stock index contracts returned to expansion in the second quarter from a slight contraction in the previous period. At the same time, turnover in the comparatively small currency segment showed signs of revival following a long period of decline. Exchanges continued to introduce a variety of new contracts, largely on stock market indices (see the box on page 42).



Hedging boosts activity in fixed income contracts

Aggregate trading in exchange-traded interest rate contracts, the largest of the broad market risk categories, continued to grow strongly in the second quarter of 2003. The volume of transactions expanded by 25% to \$226.2 trillion, compared with an increase of 18% in the first quarter. Contracts on short-term interest rates, including eurodollar, Euribor and euroyen, accounted for much of the absolute increase in business, with turnover rising by 28% to \$197.8 trillion. Business in longer-term instruments, including 10-year US Treasury notes, 10-year German government bonds and 10-year Japanese government bonds, rose at a weaker pace, with turnover up by 9% to \$28.4 trillion.

Short-term interest rate contracts drive the increase ...

The most notable feature of activity in fixed income products in the second quarter was a sharp increase in turnover in North America, where trading expanded by 39% to \$121.5 trillion. Of this total, business in short-term interest rate contracts grew by 42% to \$112.5 trillion, while that in longer-term instruments rose by 17% to \$9 trillion. Trading of short-term interest rate products on the Chicago Board of Trade (CBOT) rose by an unprecedented amount (by 148% to \$22.3 trillion), while such activity on the Chicago Mercantile Exchange (CME) expanded at a robust pace (by 28% to \$88.2 trillion).

... which takes place largely in North America ...

The notably strong increase in activity in short-term products on US exchanges during the second quarter reflected two main underlying factors. First, market participants appear to have misinterpreted a change in the way the Federal Open Market Committee (FOMC) expressed its assessment of economic conditions on 6 May. While the FOMC's decision to keep its target for the federal funds rate unchanged was largely expected, the publication of separate risk assessments for economic growth and inflation represented a significant break from the traditional practice of a single assessment of the balance of risks. In its statement, the FOMC distinguished between an economic climate for which risks seemed to be balanced and a trend in prices for which deflation was a greater risk than inflation. Markets seemed uncertain about how to interpret this new risk assessment framework, and, in particular, what it would mean for future FOMC actions. In their attempt to hedge against this new source of uncertainty, market participants increased their recourse to short-term interest rate contracts.

... as market participants react to a new policy announcement

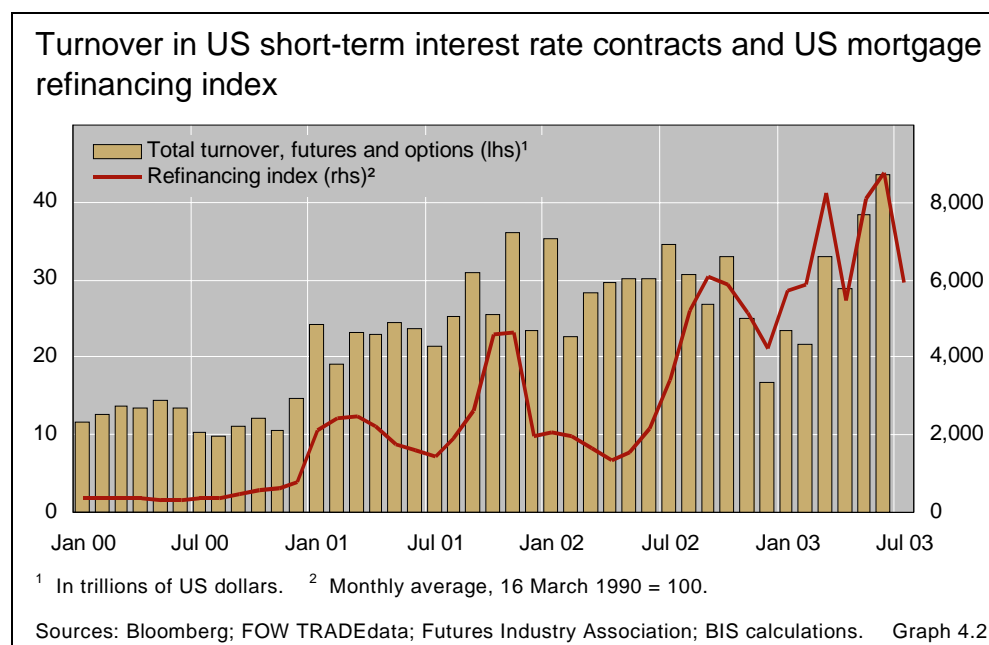
The 30-day US federal funds rate futures and options traded on the CBOT were particularly favoured by market participants. Trading in such contracts expanded at an unusually rapid pace, leading to a significant gain in their share of the US market for short-term instruments. Activity in such contracts amounted to 20% of the turnover in US money market contracts in the second quarter compared with 12% in the previous quarter and an average of 9% for 2002 as a whole. The rapid expansion of short-term contracts represents a new development for the CBOT, an exchange that has traditionally tended to dominate trading in longer-term instruments such as US government bond contracts. Federal funds futures have been traded on the CBOT since late 1988 but their use has accelerated sharply since the beginning of 2001, when the FOMC embarked on a vigorous round of reductions in the federal funds

Fed funds contracts gain market share

rate. The development of a liquid market in these futures encouraged the exchange to introduce options on them in early 2003, contracts that have found ready investor acceptance. Since federal funds contracts are directly tied to the federal funds rate, they are well suited for trading on US monetary policy actions.¹ The CME's well established eurodollar contracts have also been used extensively to trade on US policy rates. However, these contracts are tied to Libor, which means that their usefulness as trading instruments depends on the extent to which Libor tracks the federal funds rate. Trading on policy rates through eurodollar futures would involve greater basis risk than trading through federal funds futures.

Trading in fixed income contracts was also boosted by the hedging of mortgage-backed securities (MBSs). With US mortgage refinancing reaching a new record at the end of the second quarter, a large number of MBSs were subject to early repayment, leading to a further shortening in the average duration of MBS portfolios.² In order to minimise mismatches in the duration of their assets and liabilities, holders of MBSs were reported to have sought to lengthen the duration of their assets by various means, including purchasing government bonds and newly issued MBSs, taking long positions in government bond futures and contracting to receive fixed rates in interest rate swaps. While the taking of long positions in government bonds and related futures led to a direct increase in cash market and exchange-traded turnover,

The hedging of MBSs also boosts activity



¹ See R S Gürkaynak, B Sack and E Swanson, "Market-based measures of monetary policy expectations", FEDS paper 2002-40, Federal Reserve Board, August 2002. The authors found that the federal funds futures rate dominates all other market interest rates for predicting changes in the federal funds rate over horizons extending to several months.

² Investors in MBSs face significant prepayment risk since the holders of the underlying mortgages can refinance their mortgages on more favourable terms when long-term interest rates decline. See the box on page 6 for a discussion of the impact of MBS hedging on financial markets.

the taking of receiver positions in the swap market had a second-round impact on the turnover of short-term interest rate futures. Short-term futures, particularly the eurodollar contracts traded on the CME, are highly liquid and therefore commonly used by intermediaries in the hedging of swaps since a series of futures contracts extending over a number of delivery cycles can be used to create an exposure that is similar to that of an interest rate swap. Such an interpretation seems to be corroborated by Graph 4.2, which shows a degree of co-movement between the pace of US mortgage refinancing and turnover in US short-term interest rate contracts.

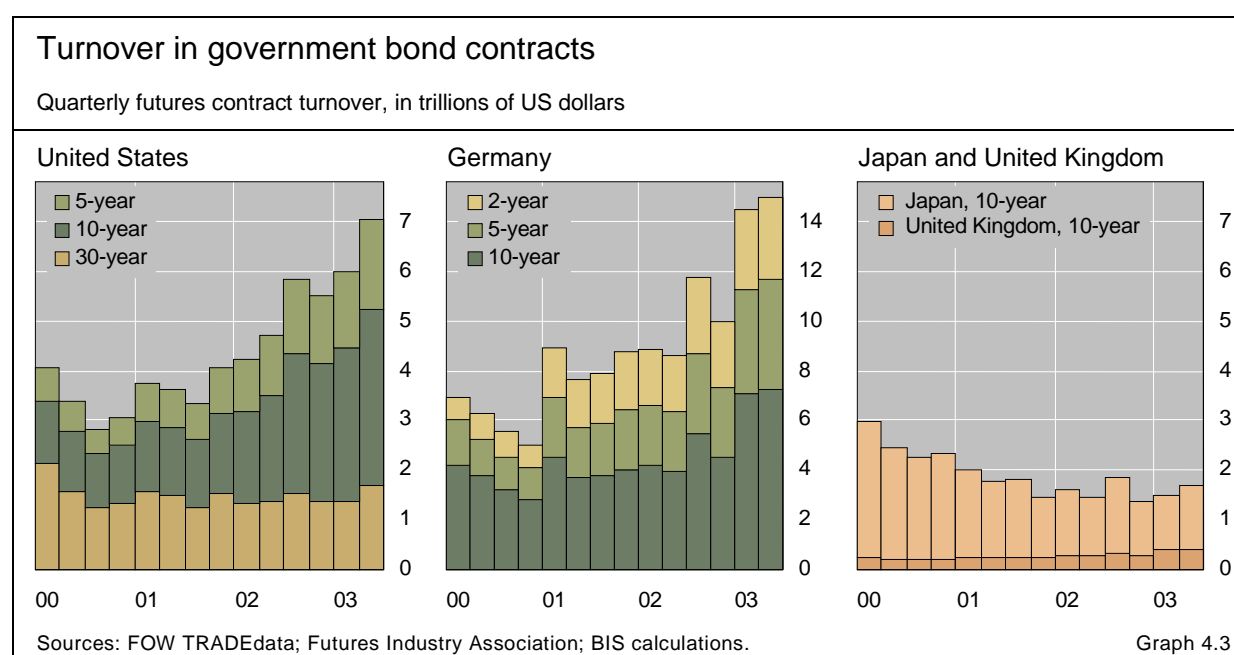
While aggregate trading in US short-term interest rate instruments rose sharply in May, it was even more buoyant in June, with activity in federal funds and eurodollar contracts reaching a maximum on 26 June. Financial markets appear to have been disappointed on 25 June by the size of the Federal Reserve's cut in policy rates and its apparent downplaying of possible recourse to unconventional monetary policy measures (see the discussion in the Overview).

The rally in US fixed income markets until mid-June also generated a significant volume of transactions involving US government bond contracts, with robust activity across the maturity spectrum (Graph 4.3). Total turnover in 10-year Treasury note futures and options, the most actively traded US government bond contracts, rose by 13%, while that in 30-year Treasury bond contracts, which were for a long time the CBOT's flagship instruments, increased by 26%. Trading in Treasury bond contracts had largely been stagnant in the wake of the US Treasury's announcement in October 2001 that it would halt sales of 30-year bonds. The recent surge in activity in that contract may have reflected the wide range of opinions concerning prospects for the evolution of the price level in the United States, given that such prospects would have a particularly significant impact on the price of long-dated assets. Speculation concerning a resumption in the issuance of 30-year Treasuries

Growing liquidity of US federal funds contracts

Robust activity in US bond contracts ...

... particularly in the long bond contracts



may also have played a role. Trading in US government bond contracts was especially buoyant in May, reaching very high levels on 28 and 29 May, when a disappointing report on durable goods orders took the shine off an earlier rally in equity markets and prompted traders to take positions in fixed income markets.

Fixed income contracts rise in Singapore and Australia

Trading in interest rate products in the Asia-Pacific region rose by 21% to \$10.7 trillion. Transactions in interest rate contracts in Singapore, the largest Asian market for such products, rose by 25% to \$5.9 trillion. Much of the rise reflected buoyant activity in eurodollar contracts. Business on Australian exchanges extended an upward trend observed since the beginning of 2001, with trading rising by 22% to \$2.5 trillion. This sharp increase seems to have been related to the hedging of new issuance in the corporate bond market. The first two quarters of the year saw unprecedented offshore issuance of Australian dollar-denominated bonds on the back of strong overseas demand. This encouraged many non-residents to issue Australian dollar debt that was swapped back into their own currency. As a result, swap spreads moved in a way that made it very attractive for Australian borrowers, particularly financial institutions, to issue foreign currency debt and swap it back into Australian dollars. This increase in swap-related issuance led to a parallel increase in exchange-traded activity as intermediaries hedged their risk exposures through short-term interest rate and government bond futures.³

Mixed pattern of activity in Japan

The pattern of activity in interest rate contracts observed on Japanese exchanges was mixed. The aggregate volume of transactions rose by 15% to \$2 trillion, with short-term contracts declining further to \$0.4 trillion and government bond contracts jumping by 25% to \$1.6 trillion. Business in government bond futures and options rose particularly abruptly in the second half of June as market participants rushed to hedge their positions or reduce their exposure to long-term fixed income assets in the wake of a disappointing auction of 20-year government bonds on 17 June (see the Overview for an analysis of developments in Japan).

Relatively modest expansion in Europe

Business in interest rate products in Europe increased at a modest pace relative to that in North America and the Asia-Pacific region. Turnover rose by 11% to \$93.3 trillion, with money market contracts expanding by 13% to \$76.2 trillion and government bond contracts up by 3% to \$17.1 trillion.⁴ Business in both short-term interest rate and bond contracts was especially buoyant in June. Trading in both types of contract reached a maximum on 5 June, the day the ECB released its monetary policy announcement. The 50 basis point cut in the ECB's refinancing rate, combined with comments by its President suggesting that further easing was likely if growth failed to accelerate, appear to have sparked a rally in euro area fixed income markets and feverish activity in related contracts.

³ For a more detailed discussion, see "Statement on monetary policy", *Reserve Bank of Australia Bulletin*, May 2003, pp 37–46, at www.rba.gov.au.

⁴ It should be noted that about half of this increase in dollar terms resulted from an appreciation of the euro relative to the dollar between the first and second quarters.

Exchange-traded markets return to life

Following a long period of stagnation, exchange-traded markets have experienced a remarkable recovery since 2001. Whereas turnover in the exchange-traded financial contracts monitored by the BIS averaged about \$360 trillion in the second half of the 1990s, average activity in the first two years of the new millennium rose by nearly 80% to \$644 trillion. Much of that higher turnover resulted from an unprecedented increase in the trading of short-term interest rate contracts to an average of \$512 trillion in 2001 and 2002. Activity in government bond contracts also increased substantially, even if by less in absolute amounts.

This recovery can be attributed to a number of factors, some of which appear to have been cyclical and others of a longer-term nature. The main cyclical factor seems to have been monetary easing since early 2001. Long-term factors include a possible shift away from the OTC market due to concerns about counterparty credit risk and the introduction of new hedge accounting rules. While more extensive research would be required in order to quantify the relative contribution of the various factors, this box offers a preliminary discussion of the most likely recent sources of market growth.

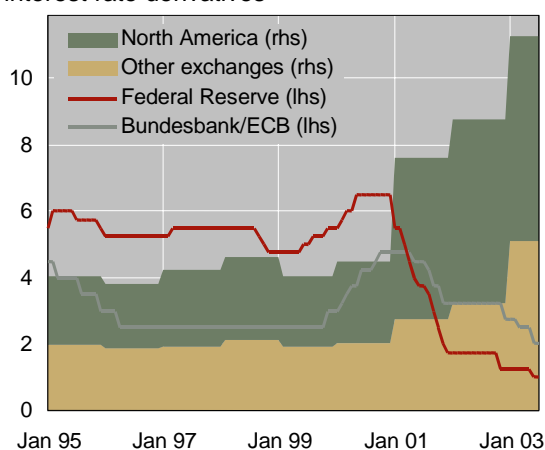
Impact of market movements

A number of empirical studies have found evidence of a positive relationship between daily or intraday volatility and turnover in exchange-traded markets.^① Recent work conducted at the BIS on monthly data shows that some of the increase in trading activity in a few US contracts was related to market volatility but that this relationship was weak and inconsistent over time.^② These results seem to apply to global trading as well. The graph below shows that the long-term evolution of global turnover in fixed income products has not been systematically related to indicators of financial market volatility. A tentative explanation is that the various trading motives may often have had offsetting impacts on aggregate turnover. A higher volume of hedging transactions could have

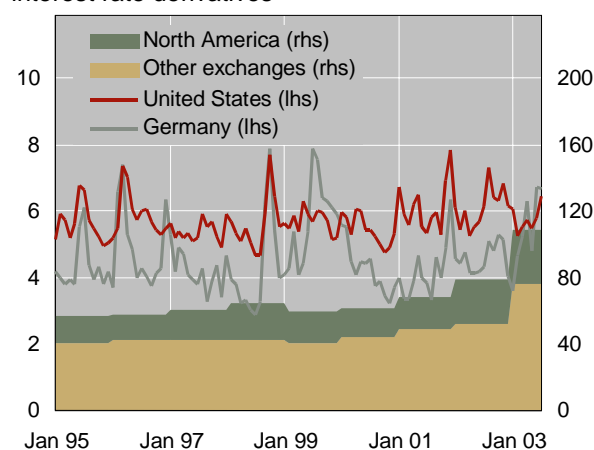
Turnover in interest rate derivatives and conditions in major fixed income markets

By region, in trillions of US dollars (rhs) and percentages (lhs)

Policy rates and turnover of short-term interest rate derivatives



Bond yield volatility¹ and turnover of long-term interest rate derivatives



Note: For 2003, turnover data for the first half-year at an annual rate.

¹ Annualised conditional variance of daily changes in 10-year government bond yields from a GARCH(1,1) model.

Sources: Bloomberg; national data; BIS calculations.

^① For an early survey see J M Karpoff, "The relationship between price changes and trading volume: a survey", *Journal of Financial and Quantitative Economics*, vol 22, no 1, 1987, pp 109–26. ^② See S Jeanneau and M Micu, "Volatility and derivatives turnover: a tenuous relationship", *BIS Quarterly Review*, March 2003, pp 57–65.

been offset by reduced speculative transactions in periods of heightened market turbulence.^③

Of course, one trading motive may at times dominate the others. This appears to have been the case in 2001 when the US Federal Reserve embarked on a round of monetary policy easing. The decline in US policy rates did not result in markedly higher volatility in US fixed income markets but it was nevertheless associated with an unprecedented expansion in the trading of US interest rate contracts. Much of that increase seems to have been fuelled by a surge in mechanically determined hedging transactions. Financial institutions, in particular, actively use fixed income derivatives to adjust gaps in the duration of their assets and liabilities as the level of interest rates changes. Such “immunisation” strategies create an unambiguously positive link between transactions and market movements.

This general relationship has been amplified in recent years by a more intensive use of derivatives contracts by a few very large market participants, such as US government-sponsored mortgage lenders. Such lenders have retained a growing share of new MBSs in their own investment portfolios, and the need to hedge the prepayment risk of those securities has led them to make greater use of derivatives contracts (see the box on page 6). This has been particularly evident since 2001. The downtrend in mortgage rates has prompted homeowners to refinance their mortgages and forced mortgage lenders to make increasingly frequent adjustments to the duration of their portfolios of MBSs.

It should be noted, however, that policy easing has not been the only factor in the recent expansion of exchange-traded markets since trading continued to be buoyant even when US policy rates remained stable, as in much of 2002. The steady rise in business observed in recent years may therefore have resulted from longer-term factors.

Concerns about counterparty credit risk

Some of the increase in exchange-traded activity may have resulted from growing concerns about counterparty credit risk. The large number of mergers and acquisitions in the financial services sector over the past decade has led to an increase in the concentration of financial markets. Such consolidation has made it more difficult for intermediaries to diversify the counterparty credit risk attached to derivatives transactions in the OTC market. Moreover, the credit quality of the major market-makers in derivatives markets has declined over the years. For example, in 1994 the largest dealer in the global interest rate swap market was rated AAA/Aaa but by 2002 its rating had declined to the lower edge of AA/Aa. Participants in the over-the-counter (OTC) market have taken various measures to mitigate counterparty risk, including daily settlement, the posting of collateral and bilateral netting. Some may also have sought to reduce counterparty credit risk and associated capital charges by stepping up their use of exchange-traded contracts.^④

Accounting changes

The introduction by the US Financial Accounting Standards Board (FASB) of new rules on derivatives and hedge accounting for all publicly traded US companies as from the fiscal year ending on 15 June 2000 and the forthcoming introduction of related rules by the International Accounting Standards Board (IASB) were reported to have had an impact on derivatives markets, with a possible shift away from OTC transactions to exchange-traded ones. FASB Statement no 133 requires US companies to record derivatives on their balance sheets as assets and liabilities that will be measured at fair value. Companies have to record in their income statement or under “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. This was reported to have prompted corporate treasuries to re-examine their use of complex derivatives transactions for fear that they would fail the hedge effectiveness test. Corporate treasurers are apparently moving to more focused hedging strategies involving the use of simpler instruments, such as exchange-traded derivatives contracts.

^③ Market movements or increases in volatility may have had a long-lasting but indirect effect on trading to the extent that they contributed to a greater awareness of the need for adequate risk management programmes. Such greater awareness has been confirmed by recent market surveys, which have highlighted the growing sophistication of corporate risk management. See, for example, the results of a survey conducted by the International Swaps and Derivatives Association in March and April 2003 at www.isda.org. ^④ The exchange's clearing house helps to ensure the financial integrity of contracts by operating a system of daily revaluation accompanied by the calling of margin to reflect changes in the net obligations of market participants. This substantially reduces credit risk.

Stock index contracts return to expansion

Trading in stock index futures and options returned to expansion in the second quarter of 2003 after a slight contraction in the previous quarter. Aggregate turnover rose by 11% to \$18.6 trillion. As was the case with fixed income contracts, the growth in activity was higher in the Asia-Pacific region, up 20% to \$6.3 trillion, and in North America, up 9% to \$8.3 trillion, than in Europe, where business expanded by only 2% to \$3.9 trillion.

Stock index
business rises in
Korea and the
United States

The increase of activity in Asia was again largely attributable to buoyant trading in options on the Korea Stock Exchange's KOSPI 200 index, particularly in April. The revelation of accounting irregularities at one of the country's largest conglomerates shook financial markets in March and April, leading to a bout of call writing on the index.⁵ Much of the expansion in stock index contracts in North America took place on the CME. The exchange has been able to capitalise on strong retail demand for its small, electronically traded "e-mini" contracts. Indeed, the e-mini S&P 500 futures have become its most actively traded equity contracts in value terms, exceeding business in the established S&P 500 futures for the fourth consecutive quarter.⁶ Aggregate trading in the major US stock index contracts was strongest on 12 June, when the release of mixed economic indicators exacerbated the dispersion of beliefs about the direction of the US economy.

Buoyancy of small
equity contracts

Tentative revival of currency contracts

Exchange-traded currency contracts, which account for less than 1% of overall turnover in financial instruments, grew by 18% to \$1.1 trillion in the second

Exchanges focus on the development of equity-related contracts

Exchanges introduced 127 new derivatives contracts in the second quarter of 2003: 80 stock index contracts, 22 single equity contracts, 15 agricultural contracts, eight interest rate contracts, one currency contract and one energy contract. Most of the new stock index contracts were on exchange-traded funds (ETFs).^① ETFs have expanded rapidly in recent years, particularly in Europe, with exchanges seeing them as a promising area for the development of new contracts. Within the area of traditional stock index contracts, mention can be made of Euronext's attempt to enter the market for pan-European stock indices by introducing futures and options on the new FTSEurofirst 80 and 100 stock indices. So far, the market for such products has been dominated by Eurex's EURO STOXX 50 contracts. In a move to further strengthen its position in such contracts, Eurex sought to attract liquidity from the OTC market by offering long-dated EURO STOXX 50 options.

^① ETFs are exchange-traded securities (or index funds) that are backed by an underlying basket of securities held in trust. They can be bought and sold at intraday prices throughout the trading day, in contrast to conventional mutual funds, which are generally purchased or redeemed only at end-of-day prices.

⁵ See the box on recent developments in Korea's financial sector on page 10 of the June 2003 issue of the *BIS Quarterly Review*.

⁶ It should be noted that the dollar value statistics produced by the BIS are limited to transactions in equity index contracts. Value data are not available for futures and options on single equities. The number of such contracts grew more rapidly than stock index contracts for much of the 1990s but since 2001 stock index contracts have returned in force.

Larger pool of traders in dollar/euro contracts

quarter of 2003. Such contracts appear to have been recovering in recent quarters from a long period of decline. This recovery stems largely from a significant increase in the turnover of dollar/euro futures on the CME, the largest marketplace in the world for exchange-traded currency contracts. Trading in the CME's major European "legacy" contracts (dollar/Deutsche mark and dollar/French franc) had declined sharply ahead of the introduction of the euro at the beginning of 1999. Although the new dollar/euro contract has since replaced legacy contracts, its turnover is only now beginning to match the volumes achieved by them in the early to mid-1990s. Market participants have noted that the introduction by the CME of round-the-clock electronic trading for its currency contracts in April 2001, combined with the US dollar's recent swings against the euro, have helped enlarge the pool of traders in such contracts. Electronic trading may enable exchanges to compete more effectively with the much larger OTC market for currency instruments.

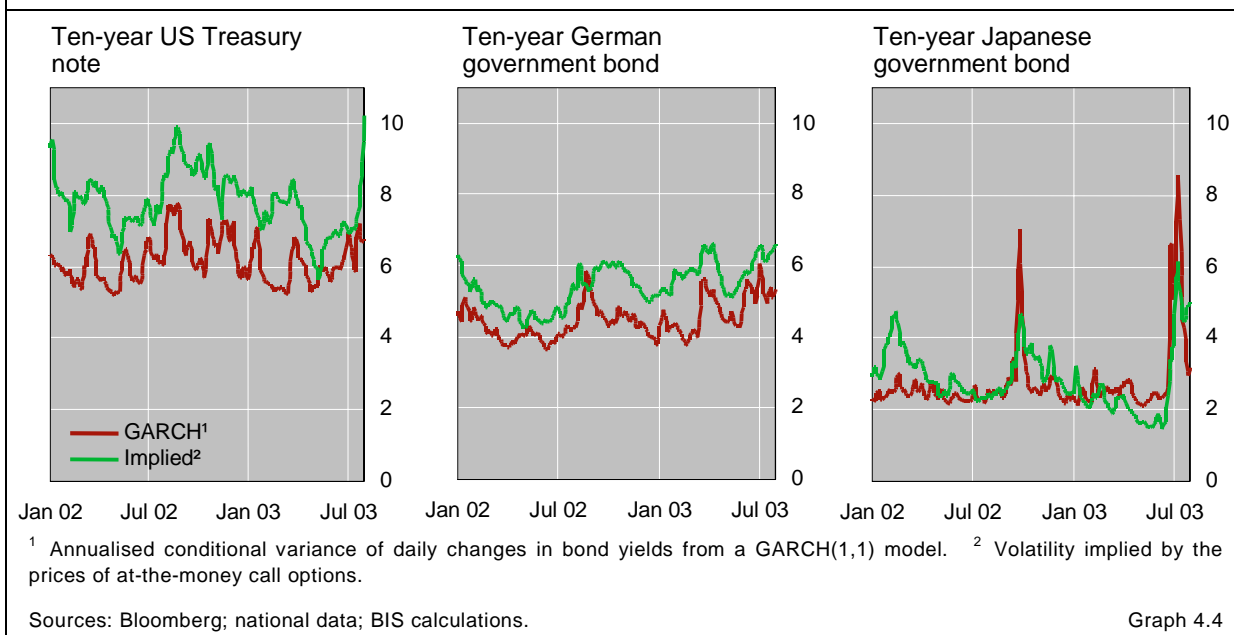
Marginal decline in global trading in July

Preliminary data on the global turnover of financial contracts monitored by the BIS for the month of July show that the number of units traded declined by 4% compared with June, to 468.9 million contracts.⁷ A 15% drop in the global volume of interest rate contracts (to 171.4 million) more than offset a 4% increase in the turnover of stock index contracts (to 291.4 million). The sharp spike in yields in the global bond market from late June had only a limited

Rise in bond yields fuels activity in US bond contracts

Volatility of major bond markets

Five-day moving averages



⁷ Statistics on the dollar value of transactions monitored by the BIS were not available at the time of writing.

impact on aggregate fixed income business in July. There was a notable increase in the trading of US government bond contracts but a decline in the turnover of US short-term rate contracts and a drop in fixed income instruments elsewhere. The rise in the turnover of US government bond contracts can probably be explained by the specific dynamics of US fixed income markets. In particular, the growing size, in both absolute and relative terms, of the MBS market has been associated with a more active use of hedging instruments. The increase in US mortgage lending rates in July led to a precipitous drop in the pace of US mortgage refinancing (Graph 4.2), confronting holders of US MBSs with a significant extension in the duration of their portfolios. This forced them to make quick adjustments to their risk exposures through derivatives contracts, leading to a pronounced increase in market volatility (Graph 4.4).