Serge Jeanneau

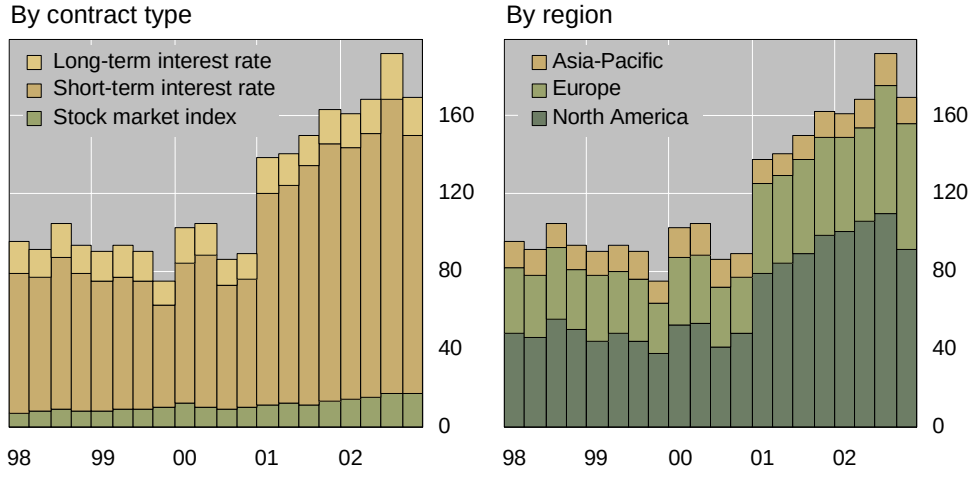
+41 61 280 8416
serge.jeanneau@bis.org

4. Derivatives markets

The aggregate turnover of exchange-traded financial derivatives contracts monitored by the BIS declined in the fourth quarter of 2002. The value of trading dropped by 12% to $170 trillion (Graph 4.1), following a 14% increase in the previous quarter. Activity was weaker across the major market risk groups, namely fixed income, stock indices and foreign exchange, although there was only a marginal reduction in the turnover of stock index contracts. Yet business was unusually brisk in October as US and European equity markets rebounded in the second week of that month. Global activity subsided sufficiently in the following two months to result in a weaker quarter than the previous one. Innovative contracts were introduced in both exchange-traded and over-the-counter (OTC) markets in the fourth quarter, including contracts on economic derivatives (see the box on page 36). For 2002 as a whole, the aggregate value of turnover in financial contracts rose by 17% to $694 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

Contraction of market activity due to drop in interest rate contracts

Trading in exchange-traded interest rate contracts dropped by 13% to $152.3 trillion in the fourth quarter of 2002, compared with an increase of 14% in the previous quarter. Contracts on short-term (money market) interest rates, by far the largest segment of exchange-traded markets in value terms, accounted for much of the absolute decline in activity, with turnover contracting by 13% to $132.1 trillion.[1]

Contraction in US short-term business ...

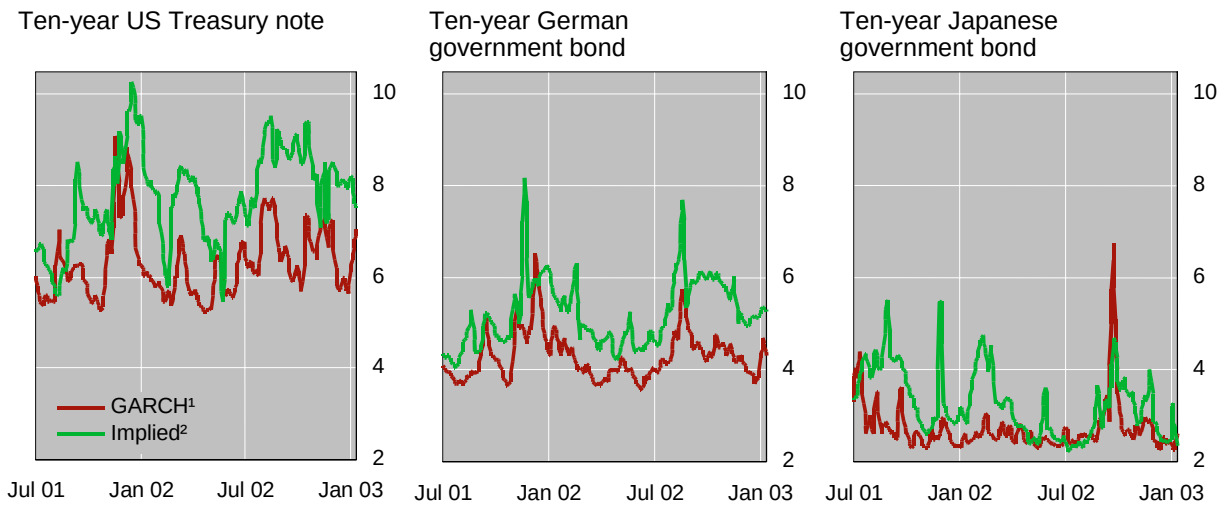
A notable feature of interest rate business in the fourth quarter was the pronounced contraction in US short-term activity. Turnover in US short-term contracts, the largest market for short-term instruments, declined by nearly 20% to $74 trillion. In October business in US short-term products was buoyant, with the turnaround in equity markets prompting traders to adjust their views on future economic growth and prospective monetary easing (see the Overview). Market sources reported that the record increase in mortgage refinancing in the first week of October and the threat of war in the Middle East had propelled the implied volatility of short-term interest rate options and swaptions to historically high levels. However, turnover contracted sharply after the Federal Reserve's surprising half point cut in policy rates on 6 November led market participants to believe that such rates would remain stable for some time. Activity declined further in December as market participants unwound their positions ahead of the year-end.

... in the wake of Fed easing

In Europe, turnover in short-term instruments increased slightly to $49.8 trillion. The monthly pattern of activity was fairly similar to that seen in the US market. Business reached an all-time record in October and declined

Volatility of major bond markets

Five-day moving averages



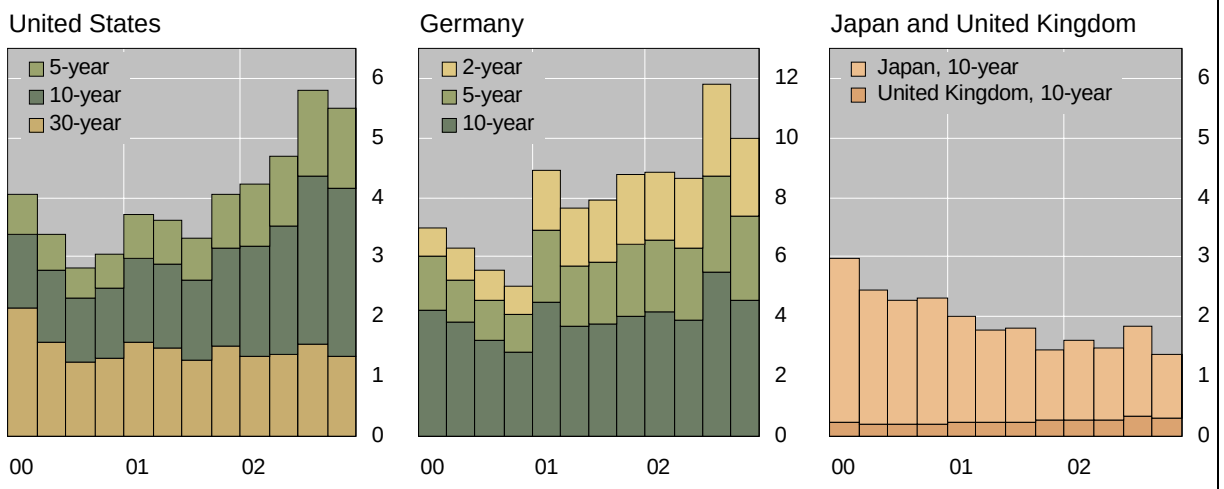
[1] Annualised conditional variance of daily changes in bond yields from a GARCH(1,1) model. [2] Volatility implied by the prices of at-the-money call options.

Sources: Bloomberg; national data; BIS calculations. Graph 4.2

[1] Including contracts based on eurodollar, Euribor and euroyen rates.

Turnover in government bond contracts

Quarterly futures contract turnover, in trillions of US dollars



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

gradually in the following two months. However, turnover remained at historically high levels throughout the quarter. As a result of this differential pattern of activity, European short-term activity edged up relative to US business. Turnover on European exchanges amounted to about 40% of US activity in the first half of 2002 but this increased to nearly 60% in the second half of the year.

Broad contraction in bond contracts ...

Activity in government bond contracts declined by 12% globally to $20.2 trillion, with the contraction broadly spread across geographical areas (Graph 4.3). Business in German government bond contracts, the largest market for such contracts, dropped by 13% to $10.9 trillion. As was the case with European short-term contracts, business in German government bond contracts reached a record in October and then subsided in the following two months. The slowdown affected most futures and options, with the bund contract seeing the most pronounced contraction. Options on two-year German government bond futures (or "schatz" in market parlance) were a notable exception, expanding by 56%. Such options have grown markedly since the beginning of 2002 and are now almost as actively traded as options on bund futures. Schatz contracts are used actively for positioning on potential changes in policy rates.

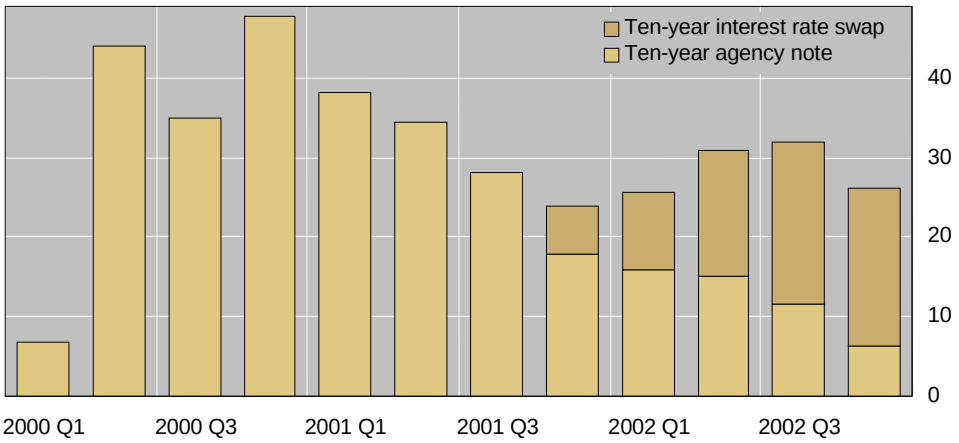
... with a particularly sharp drop in Japan

Trading in Japanese government bond contracts declined even more markedly than that in German contracts, with transactions dropping by 28% to $1.3 trillion. Turnover had risen sharply in September, with investors reacting to the potential fiscal implications of banking reform. Further news concerning financial reform had some impact on the Japanese government bond market in October but the effect on derivatives turnover appears to have been limited.

Activity in US Treasury contracts declined by somewhat less than in the other two major markets, with turnover down by 6% to $7.1 trillion. Most futures

Turnover of 10-year US agency note and interest rate swap futures

Notional amounts, in billions of US dollars



Source: FOW TRADEdata. Graph 4.4

and options witnessed a contraction, although activity in 10-year Treasury note contracts rose marginally on the back of a small increase in the turnover of options.

Expansion of US swap futures

One notable recent development in the US market has been the gradual displacement of the CBOT's 10-year US agency note futures by the exchange's own 10-year interest rate swap futures (see Graph 4.4). Agency note futures were introduced in early 2000 but failed to develop sufficient liquidity to enable market participants to execute their hedges cost-effectively. Interest rate swap futures were launched in the last quarter of 2001 and, although their turnover pales in comparison to the CBOT's 10-year Treasury futures, they have nevertheless expanded at a steady pace. Rates on comparable agency notes and swaps are highly correlated, which means that in principle the two futures should be close substitutes for hedging and trading on non-government rates. However, the agency futures contract is physically settled, which makes it somewhat less appealing to traders than the cash-settled swap futures contract.[2]

Stock index contracts steady

Activity in stock index contracts was fairly steady, declining marginally to $17.3 trillion. However, this outcome resulted from a diverging pattern of activity across regions. Declines of 6% and 10% on US and European marketplaces respectively were offset by growth of 17% in Asia. The expansion of Asian business largely reflects the continuing development of stock index activity in Korea, a market that now accounts for 30% of global turnover in such products.

[2] Physical settlement tends to be more complex since it involves a delivery option giving the seller of a contract a choice in the tendering of instruments satisfying his delivery obligations.

Exchanges introduce innovative contracts in fourth quarter

In November, One Chicago (a joint venture between the three big Chicago exchanges) and NQLX (a joint venture between Nasdaq and Euronext.liffe), launched US trading in futures on single stocks. Both exchanges provide for the electronic trading of their respective contracts. Fears that futures on single stocks would have an adverse impact on the trading and volatility of underlying shares had led to a ban in the early 1980s.[①] Although futures on single stocks have been traded for years on some marketplaces, they have yet to find broad market acceptance. The global volume of transactions in single stock futures amounted to less than 2% of the number of trades in single stock options in 2002.

In the same month, One Chicago and NQLX also launched futures on a number of US exchange-traded funds (ETFs).[②] Options on ETFs have been traded in the United States since 1999 but futures on such instruments have only been allowed recently. At the same time, Eurex became the first European exchange to list futures and options on a number of domestic and pan-European ETFs. ETFs have expanded rapidly in recent years and exchanges see them as a promising area for the development of new contracts.

[①] The securities industry had expressed fears that futures contracts based on the equity or debt securities of a single issuer might have an adverse impact on the cash market for the underlying securities. The Shad-Johnson Accord of 1982 included a ban on futures contracts on single equities, which was removed in December 2000 with the passage of the Commodity Futures Modernization Act of 2000. [②] ETFs are exchange-traded securities (or index funds) that are backed by an underlying basket of stocks 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.

Exchange-traded activity remains buoyant in 2002

For 2002 as a whole, the aggregate value of turnover in exchange-traded financial derivatives monitored by the BIS rose by 17% to $694 trillion. This compares to an increase of 55% in the previous year.

Stock index contracts active in 2002

Business in stock index contracts grew by 32% to $64 trillion, fuelled largely by the rapid expansion of option contracts in Korea, the development of continental indices in Europe and the success of retail-targeted index contracts in the United States. Turnover in interest rate products, the largest segment of the market for exchange-traded financial instruments, increased by 15% to $627 trillion. The percentage increase in short-term rate contracts was comparable to that on government bond contracts. Aggregate activity on money market and government bond contracts amounted to $548 trillion and $79 trillion respectively. Lastly, currency contracts increased by a modest 3% to $2.9 trillion. Exchanges have failed so far to compete successfully with OTC markets in this segment. This is largely explained by the availability of a wide range of liquid short-term hedging and trading instruments in the international interbank market.

Economic derivatives: new contracts on information events

Blaise Gadanecz

In October 2002, Deutsche Bank and Goldman Sachs introduced a new kind of option in the OTC derivatives market. The options allow market participants to take positions on important US macroeconomic data releases. This box describes innovative aspects of these options and discusses the information that can be extracted from their prices.

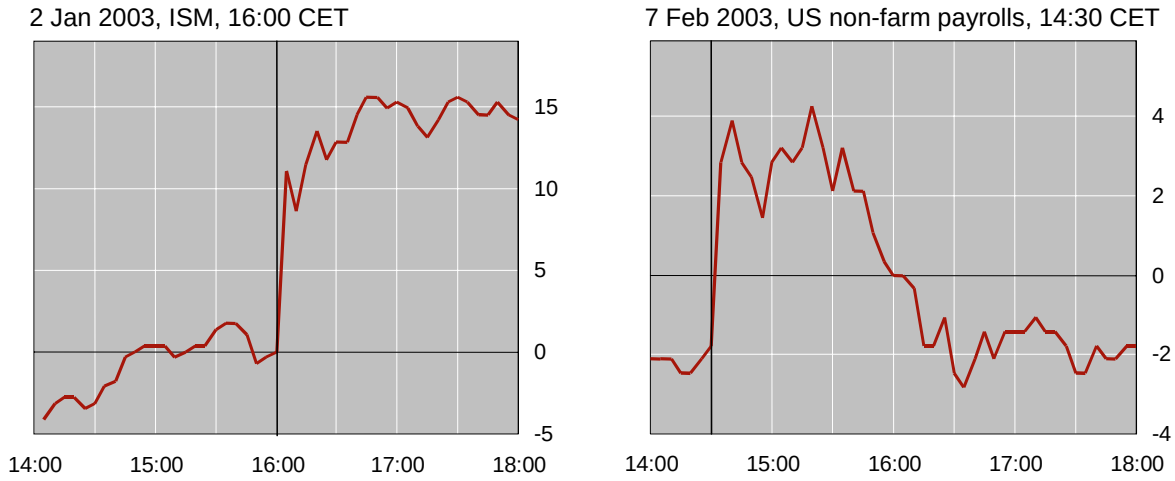
The releases of scheduled US macroeconomic announcements are among the most important information events in financial markets. The most closely watched indicators include the employment report, the ISM manufacturing index, the producer price index (PPI) and retail sales. These are each released once a month. They are all scheduled in the sense that market participants know not only the day of the release but also its precise time. The employment report, for example, is released on Friday at 14:30 Central European Time.

The highest price volatility in the US Treasury market is typically found in intervals of just a few minutes around these announcements, reflecting market participants' forceful and instantaneous reaction to the new information.[1] The graph below illustrates the market's reaction to typical surprises in macroeconomic announcements. The ISM manufacturing index data for December 2002 revealed a rise in new orders, production and other indicators, causing Treasury yields to jump. The release of the non-farm payrolls for January showed surprisingly strong growth in employment, and yields initially rose, although this effect was overshadowed by other factors later in the day.

The innovative feature of the new options is that they explicitly recognise the existence of a data release and allow participants to take positions on the actual numbers to be announced. In the past, a speculator could take a position only on the direction of the surprise, that is, on whether the actual number would be smaller or larger than expected. For example, if one thought that the change in the number of jobs for non-farm payrolls in the employment report would be greater than that in the economists' consensus forecast, one could take a short position in Treasury securities. A higher than anticipated number would indicate economic strength and thus lead to a decrease in

Five-year yields on announcement days

Difference from yield quoted at announcement for US Treasury note, in basis points



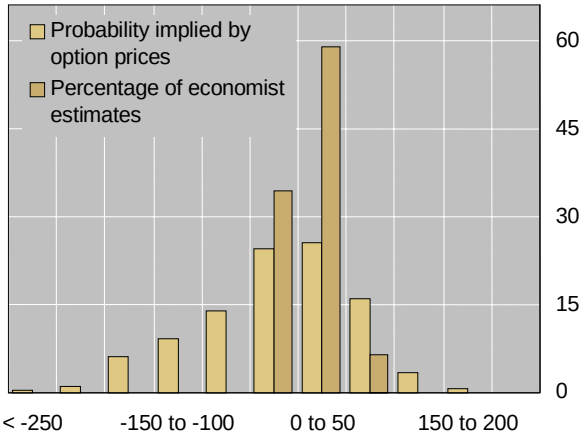
Note: Yields quoted in five-minute intervals between 14:00 and 18:00. The vertical line denotes the time of the announcement; the vertical axes represent the difference from the yield at announcement.

Sources: Bloomberg; BIS calculations.

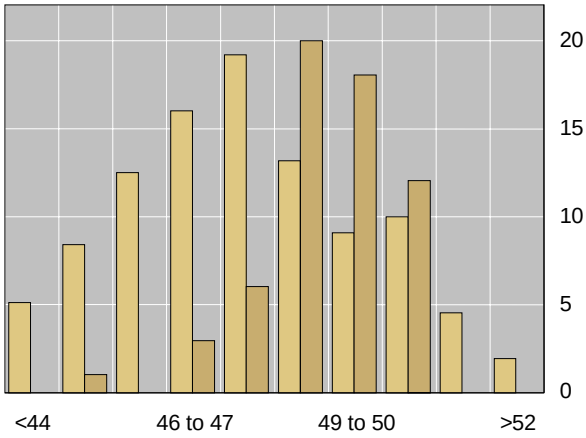
[1] See E M Remolona and M J Fleming (1999): "Price formation and liquidity in the US Treasury market: the response to public information", *The Journal of Finance*, vol LIV, no 5, October. See also C Furfine (2001): "Do macro announcements still drive the US bond market?", in *BIS Quarterly Review*, June.

Economists' forecasts vs probabilities implied by option prices

US non-farm payrolls, September 2002[1]



ISM manufacturing index, October 2002[2]



[1] Bureau of Labor Statistics data release of 4 October 2002; absolute changes, in thousands. [2] Institute for Supply Management data release of 1 November 2002, in percentage points.

Sources: Bloomberg; Deutsche Bank; BIS calculations.

bond prices. However, one could not have taken a position on whether the number would be 50,000 jobs greater rather than only 10,000 jobs greater than expected. One can do so with the new options since the strike prices specify particular levels for the announcements.

The options are traded in Dutch auctions with settlement payments corresponding to the difference between the strike and the actual outcome of the indicator.[②] Goldman Sachs acts as counterparty on every executed option. Auctions have taken place or are scheduled for such announcements as the non-farm payrolls number in the employment report, the ISM manufacturing index and retail sales. There are plans to also offer options on European macroeconomic indicators.

The option prices that result from the auctions allow a calculation of the implied probabilities attached to the various outcomes of the announcements.[③] However, it is important to note that these are "risk neutral" probabilities, which in the terminology of modern finance theory actually mean probabilities that incorporate risk premia. Hence, an outcome to which investors are averse would be assigned an implied or "risk neutral" probability that is higher than the objective or empirical probability.

The graph above illustrates probability distributions for two announcements, namely the change in US non-farm payrolls for September 2002 and the ISM manufacturing index for October 2002. There are two probability distributions for each announcement, one based on option prices observed at the closing of the auction held before the release, the other based on the frequency distribution of economists' forecasts. Note that the two distributions differ since they are based on different populations of market participants. The implied distributions tend to attach higher probabilities to negative outcomes. The reason for this is that the distributions of economists' forecasts reflect empirical probabilities, while the distributions derived from options prices incorporate market risk premia. Their comparison allows one to gauge the extent of investor risk aversion. By supplying an additional, forward-looking measure of market expectations about the outcome of macroeconomic indicators, economic derivatives could contribute to a more efficient incorporation of macroeconomic fundamentals into prices.

[②] In financial markets, the term "Dutch auction" refers to a tender mechanism whereby securities are allocated to the highest bidders until the total amount of securities on offer is covered. All successful bidders pay the price quoted by the lowest bidder. The Dutch auction is sometimes known as a unitary or uniform price auction. [③] Option prices are determined in part by the probability attached by the market to possible values of the underlying asset on the maturity date of the option. By comparing options with different strike prices, it is possible to infer the probabilities that the market attaches to different levels of the underlying asset price. Such probabilities can then be used to construct an implied distribution of the asset price.