
The euro interest rate swap market¹

The euro interest rate swap market is one of the largest and most liquid financial markets in the world. Indeed, the swap curve is emerging as the pre-eminent benchmark yield curve in euro financial markets, against which even some government bonds are now often referenced. However, owing to the current structure of the swap market, liquidity is not as robust to market stress as in the larger government securities and futures markets.

Size and growth of the swap market

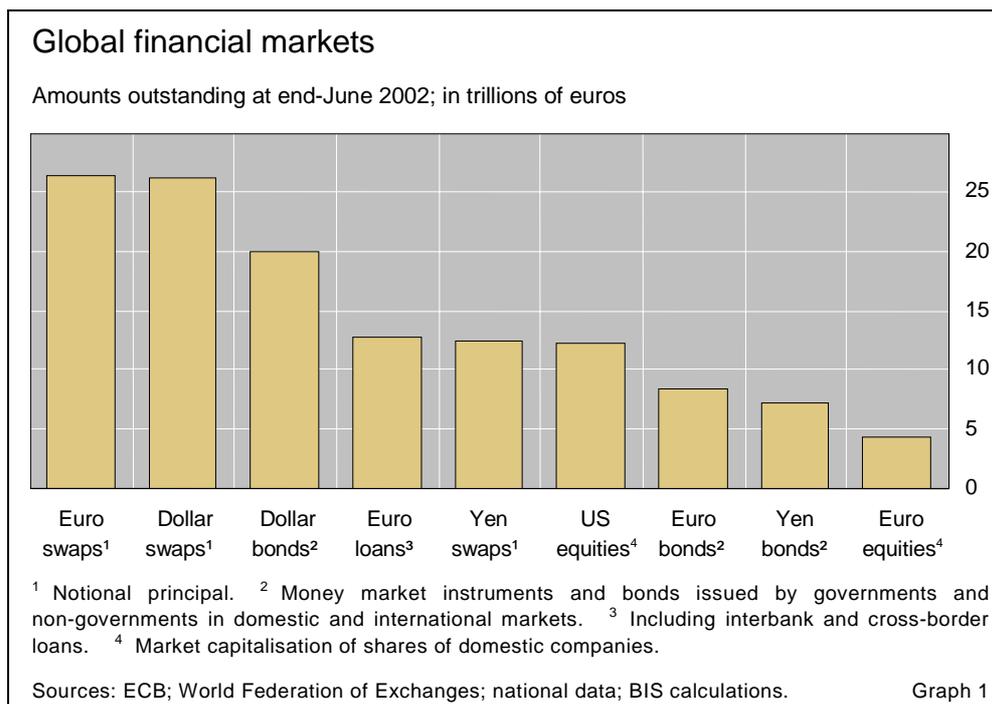
An interest rate swap is a contract between two parties to exchange streams of interest payments. Typically, one stream of payments is based on a fixed rate of interest and the other stream on a floating rate of interest. Only the net cash flows are paid; the notional principal on which the interest payments are calculated is not exchanged. A forward rate agreement is equivalent to a single-period interest rate swap, in which interest payments are exchanged only once. A swap can be characterised as a portfolio of forwards.

In terms of notional principal outstanding, over-the-counter markets for euro- and US dollar-denominated interest rate derivatives are the largest financial markets in the world (Graph 1). The notional stock of euro-denominated interest rate swaps and forwards totalled €26.3 trillion at end-June 2002. The stock of US dollar-denominated contracts was slightly smaller, at €26.2 trillion.

Interest rate swap markets in several of the euro legacy currencies, especially Deutsche marks and French francs, were large and growing even before European monetary union. Since the launch of the single currency, the euro swap market has nearly doubled in size (Graph 2). The growth of the euro swap market significantly outpaced the growth of euro bond and loan markets, which expanded by approximately 40% and 25%, respectively, between end-December 1998 and end-June 2002. However, the US dollar swap market grew even faster, increasing by 170%. Whereas the US dollar swap market was much smaller than the euro swap market on the eve of monetary union, by end-June 2002 it was approximately the same notional size.

The euro swap market has doubled in size since 1999

¹ The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS.



Swaps as benchmark instruments

The growth of the euro swap market was driven by hedging and positioning activity. Following monetary union swaps quickly gained benchmark status in euro financial markets, displacing some of the benchmarks in the legacy currencies as the locus for price discovery about future short-term interest rates.

The introduction of the euro led to a surge in euro-denominated bond issuance, and this in turn boosted arbitrage and hedging activity by issuers, dealers and investors. Participants in European markets began to use interest rate swaps to hedge their holdings of non-government bonds in the early 1990s, several years before participants in the US dollar and other markets began to do so. At that time, financial institutions were the dominant non-government issuers in European markets, and as a result quality conditions in the non-government bond market were similar to those in the swap market. Participants in European markets thus became accustomed to hedging credit products with swaps.

The fragmented nature of European government securities markets strengthened the incentive to switch to swaps for speculating on and hedging interest rate movements. The market for unsecured interbank deposits was among the first euro financial markets to become integrated and, given that swap rates embody expectations of future interbank rates, this contributed to the rapid integration of swap markets in the euro legacy currencies. In fact, a single euro swap curve emerged almost overnight. Therefore, short positions – positions taken in expectation of an increase in interest rates – can be created with relative ease in the swap market, by choosing the “pay fixed” side of a swap. In contrast, the secured market, specifically the general collateral repo market, was slower to break out of the segmentation that characterised it prior

Swap trading was boosted by hedging activity ...

... the fragmented nature of European government markets ...

to monetary union. Differences in governments' credit ratings, settlement systems, tax regimes and market conventions remain obstacles to the complete integration of euro government securities markets (ECB (2001b)). As a result, a single market for general collateral repos does not yet exist; market participants must still specify the nationality of government debt used as collateral before they conclude a repo transaction (ECB (2001a)). This complicates the use of government securities to hedge or speculate on interest rate movements.

... and traumatic market events

The switch to swaps was reinforced by a series of traumatic market events in the late 1990s. Events surrounding the near collapse of Long-Term Capital Management in September 1998 highlighted the risks inherent in the use of government bonds and related derivatives to hedge positions in non-government securities. This had been a routine strategy among dealers up until that time, albeit more so in the US dollar market than in the euro market. Squeezes in German government bond futures contracts over the 1998–2002 period had a similar effect. Temporary increases in the scarcity premium on euro government securities during auctions of third-generation mobile telephone licences in 2000 also made government securities less attractive for hedging and position-taking purposes.

Rapid growth of trading in short-dated EONIA swaps

Overnight index swaps (OISs) have become especially popular hedging and positioning vehicles in euro financial markets. An OIS is a fixed-for-floating interest rate swap with a floating rate leg tied to an index of daily interbank rates.² In the euro market, OISs are overwhelmingly referenced to the euro overnight index average (EONIA) rate – a weighted average of interest rates contracted on unsecured overnight loans in the euro area interbank market. Trading in EONIA swaps is highly concentrated in maturities of three months or less, and EONIA swap rates are widely considered to be the pre-eminent benchmark at the short end of the euro yield curve. Banks, pension funds, insurance companies, money market mutual funds and hedge funds all make extensive use of EONIA swaps to hedge and speculate on short-term interest rate movements (ECB (2001a, 2002)). OISs are also traded in US dollars and other major currencies, but they have not gained benchmark status in these markets.

The benchmark status of the euro swap curve is reflected in quoting practices for corporate bonds. These practices often depend on the credit quality of the issuer and the nationality of the investor. Euro-denominated bonds issued by investment grade borrowers are usually quoted in terms of a spread over the swap curve. For non-investment grade corporate bonds, prices are quoted in the form of outright yields. Interest rate swaps are becoming more widely used as benchmark instruments in the US dollar market too (McCauley (2001)). However, the shift is less advanced than in the euro

² One significant difference between an OIS and a plain vanilla interest rate swap is that the floating rate leg of an OIS is determined and paid only at maturity. In a plain vanilla interest rate swap, the floating rate leg is determined at one settlement date and paid at the next, ie determined in advance and paid in arrears.

Turnover of interest rate products				
Average daily turnover, in billions of euros				
	Total turnover ¹		Of which: Futures turnover	
	April 1998	April 2001	April 1998	April 2001
Euro market				
Interest rate swaps ^{2,3}	112	260	...	1
Euribor futures ⁴	...	...	198	404
German government securities ⁵	99	202	76	150
Italian government securities	316	195	14	...
French government securities	110	130	6	15
US dollar market				
Interest rate swaps ^{2,6}	54	156	...	...
Libor futures	...	...	465	958
US government securities	253	396	54	63
Yen market				
Interest rate swaps ²	16	28	...	...
Libor futures	...	...	83	29
Japanese government securities	111	195	26	32

¹ Trading activity in money, bond and futures markets. ² Including interest rate forwards.
³ LIFFE began trading euro swap futures in March 2001. ⁴ Data for 1998 refer to futures contracts referenced to Deutsche mark Libor, Lira Libor, Mibor, Pibor and Ribor. ⁵ Data on money and bond market turnover refer only to the most actively traded bonds on Euroclear and probably underestimate cash market turnover of German government bonds by a significant amount. Data on cash market turnover for 2001 refer to January 2001. ⁶ The Chicago Board of Trade began trading US dollar swap futures in October 2001, and the Chicago Mercantile Exchange and LIFFE introduced US dollar swap futures in April 2002 and July 2002, respectively.

Sources: Euroclear; FOW TRADEdata; Futures Industry Association; national data; BIS calculations. Table 1

market. For example, many US investors still prefer to price dollar-denominated corporate bonds against the Treasury yield curve rather than the swap curve.

Notwithstanding the growth of the euro swap market, futures contracts continue to be heavily used as hedging and positioning vehicles. Indeed, trading in euro-denominated money and bond market futures soared in the run-up to and years immediately following the introduction of the single currency (Table 1). Contracts based on three-month Euribor – a trimmed average of interest rates quoted for term deposits in the euro area interbank market – and traded on the London International Financial Futures and Options Exchange (LIFFE) are by far the most actively traded short-term interest rate futures in the euro market. Contracts based on German government securities and traded on Eurex dominate activity in longer-term euro futures.

Participants in the swap market

The growth of the euro swap market has been accompanied by greater diversity in the range of players using interest rate swaps. In the run-up to European monetary union, the inter-dealer segment drove the growth of the euro swap market. At end-1998, positions vis-à-vis other dealers accounted for 52% of the outstanding notional amount of euro interest rate swaps and

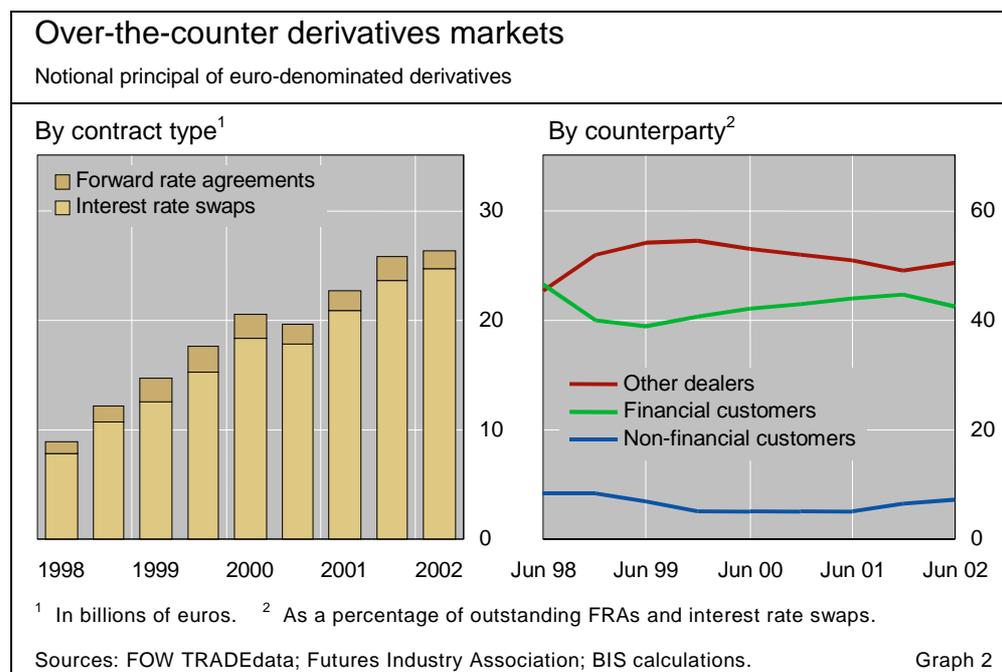
Greater diversity in the range of players using swaps ...

forwards. Since 1999, the dealer-customer segment has become increasingly important (Graph 2). By end-June 2002, positions vis-à-vis financial customers accounted for 42% of the outstanding notional amount of euro interest rate swaps and forwards, and positions vis-à-vis non-financial customers a further 7%. By comparison, in the dollar swap market, positions vis-à-vis financial customers accounted for 41% of outstanding contracts, and positions vis-à-vis non-financial customers 15%. The smaller share of the dollar swap market accounted for by inter-dealer positions – 45%, compared to 51% in the euro market – is explained in part by greater concentration in the dollar market, which results in dealers offsetting more of their transactions internally rather than with other dealers.

Even European governments have begun to use interest rate swaps to manage their risk exposures. The French government has since October 2001 employed swaps to shorten the average maturity of its debt.³ As of end-July 2002, it had written swaps totalling €61 billion in notional principal, equivalent to approximately 8% of outstanding French government debt. The German government uses swaps to lower its interest costs. At present, it is authorised to swap up to €20 billion, equivalent to about 3% of its outstanding debt. The Dutch, Italian and Spanish governments are also active in the euro swap market. The entry of governments into the interest rate swap market has tended to put a ceiling on euro swap spreads. When the spread between government yields and swap yields widens, governments find it attractive to receive fixed in the swap market.

Although the range of players using swaps is increasing, the number of intermediaries is declining. Swaps are overwhelmingly traded over the counter (OTC), and so dealers are critical to the functioning of the swap market. Given

... including European governments



³ The French government temporarily suspended its swap programme in September 2002 owing to concerns about the level and volatility of swap spreads.

customers' traditional preference for dealing with high-quality counterparties, trading in OTC markets has long been dominated by a handful of better-rated dealers. In particular, the major dealers have tended to be commercial banks with credit ratings of at least double-A.⁴ In recent years, intermediation in OTC markets has become even more concentrated owing to mergers and acquisitions. For example, following the merger of Chase Manhattan and JP Morgan in 2000, the combined entity's share of the global OTC interest rate derivatives market equalled approximately 25%. In the EONIA swap market, the five largest dealers accounted for 48% of all trading activity during the second quarter of 2001, and the 20 largest dealers 88% (ECB (2002)). Other segments of the euro interest rate swap market were more concentrated, with the five largest dealers accounting for 60% of turnover. The euro swap market, however, is less concentrated than the dollar market. Two banks hold nearly three quarters of all interest rate derivative contracts booked by US banks, and the five largest banks hold over 90% of outstanding contracts.

But intermediation is concentrated among a handful of dealers

Banks headquartered in the euro area are the most active dealers in the euro swap market, writing 46% of notional contracts outstanding at end-June 2002 (Table 2). Among euro area banks, German banks are the largest

Market shares of the largest swap dealers			
As a percentage of notional swaps outstanding at end-June 2002			
Headquarters of dealer ¹	Euro swaps ²	Dollar swaps ²	Yen swaps ²
Euro area	45.8	24.2	19.5
Germany	20.5	13.1	11.0
Deutsche Bank, Dresdner Bank, Commerzbank, HypoVereinsbank			
France	14.7	7.1	7.3
BNP Paribas, Société Générale, Crédit Agricole			
Belgium, Italy, Netherlands	10.6	4.0	1.2
ABN AMRO, Rabobank			
United States	35.0	53.8	37.2
JP Morgan Chase, Bank of America, Citigroup, Goldman Sachs, Merrill Lynch			
Japan	2.0	4.5	33.1
Fuji Bank, Bank of Tokyo-Mitsubishi, Sumitomo Bank			
Canada, Sweden, Switzerland, United Kingdom	17.2	17.4	10.3
UBS, Royal Bank of Scotland, Barclays, HSBC			
<i>Memo: Notional principal, in billions of euros</i>	26,322	26,247	12,507
¹ Individual dealers identified had outstanding swap contracts of at least €1 billion at end-2001. ² Interest rate swaps and forwards.			
Sources: Swaps Monitor; national data; BIS calculations.			Table 2

⁴ Securities firms tend to be lower-rated than banks, typically single-A. In the late 1980s and early 1990s, a number of securities firms set up triple-A derivatives subsidiaries, but these subsidiaries never captured a substantial share of the market.

dealers, with a 21% market share, followed by French banks at 15%. US banks' share of the euro swap market was 35% at end-June 2002. By comparison, US banks' share of the dollar swap market was 54%. Japanese banks play only a marginal role in the euro and dollar swap markets but have a 33% share of the yen market.

Pricing of euro swaps

EONIA and Euribor are the most common reference rates

The pricing of interest rate swaps in general depends on the interest rate used for the floating rate leg of the contract. The yield used for the fixed rate leg is supposed to embody expectations about the future path of the floating rate for the life of the contract and the risk associated with the volatility of that rate. For euro swaps, the choice of the floating rate tends to depend on the contract's maturity. As discussed above, for short-dated swaps, EONIA is the most common basis for the floating rate leg. Euribor was commonly referenced following monetary union, but by 2000 had been superseded by EONIA at the short end of the swap curve. For longer-dated swaps, Euribor remains the key reference rate. The underlying instruments for both EONIA and Euribor are unsecured interbank deposits, and therefore these rates reflect a degree of credit risk. Indeed, most of the banks in the EONIA and Euribor contributor panels are rated double-A (BIS (2001)).

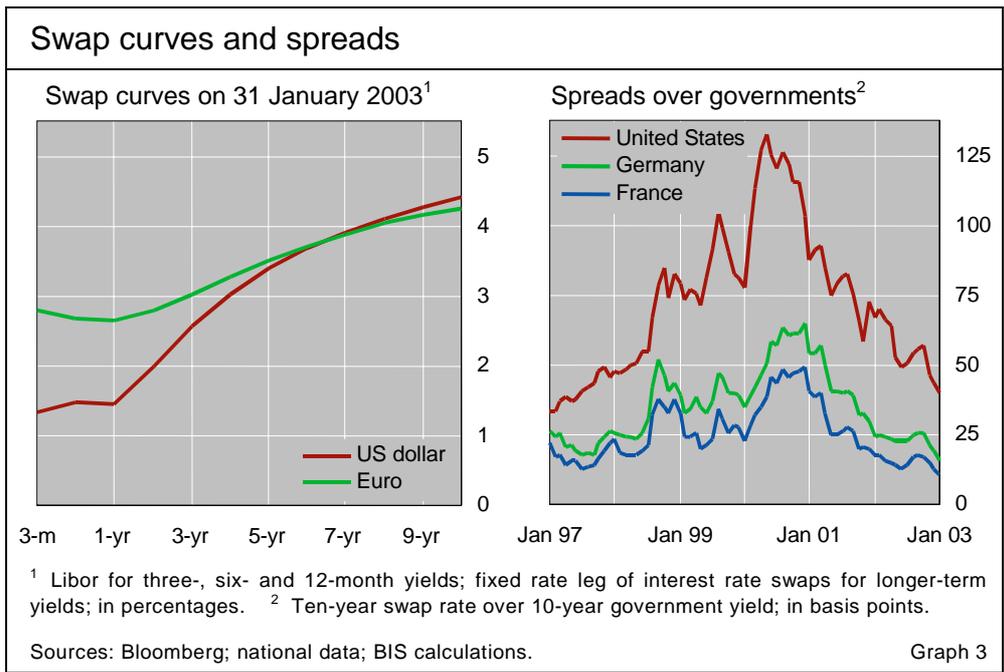
The pricing convention for euro swaps is to provide quotes in terms of the yields that specify the fixed payments for the contracts. This is unlike the convention for US dollar swaps, which are typically quoted in terms of spreads over US Treasury yields. Hence, the price of a five-year euro swap might be quoted as 4%, without any reference to a government bond yield, while that of a five-year US dollar swap might be quoted as 50 basis points over the five-year US Treasury yield.⁵

Swap rates include a premium for counterparty risk

In spite of the benchmark status of euro swaps, their yields still tend to hover above the yields for the most liquid triple-A rated government bonds in a given maturity, just as dollar swap yields tend to be higher than US Treasury yields. At the 10-year maturity, for example, the fixed rate on euro swaps at end-January 2003 was about 20 basis points above the yield on the German bund (Graph 3). Swap rates are typically higher than rates on triple-A rated securities because they contain a premium for counterparty credit risk, which is often associated with the major dealers in the market. Alternatively, a deterioration in the perceived creditworthiness of the government could result in a narrowing of the spread. For example, fiscal difficulties in Germany appeared to contribute to a narrowing of the spread between euro swaps and German government bonds in 2001 and 2002 (Artus and Teiletche (2003)).

In the past, a customer could mitigate counterparty risk by spreading positions across several dealers. As consolidation in the financial industry reduced the number of active swap dealers and credit ratings of the remaining

⁵ To be more precise, quoting in spreads for US dollar swaps is conventional for dealers in New York, while quoting in yields for this contract would be more typical for dealers in London.



dealers were downgraded, daily settlement and especially collateralisation became increasingly common. The widespread use of such mechanisms for mitigating counterparty risk resulted in narrower and more stable swap spreads. Nevertheless, counterparty risk can still at times unsettle the swap market. For example, credit concerns about several large US banks – including major derivatives dealers – caused dollar and, to a lesser extent, euro swap spreads to widen in July 2002 (BIS (2002b)).

Collateralisation is increasingly common

Other possible influences on swap spreads include the general level of interest rates and the slope of the yield curve. However, the economic rationale behind these factors is difficult to explain, and their relationship with spreads tends to be unstable over time. Liquidity was a concern in the past but, as discussed below, liquidity in the euro swap market is now such that yields tend not to be driven by imbalances in supply and demand.

Market liquidity

European swap markets were already quite liquid prior to monetary union, and they gained liquidity following the introduction of the single currency. The use of interest rate swaps by some market participants as hedging and positioning vehicles increased the willingness of other participants to do likewise, resulting in a self-reinforcing process whereby liquid markets become more liquid.

As described in CGFS (2000), a liquid market is one “where participants can rapidly execute large-volume transactions with a small impact on prices”. There are at least three dimensions to market liquidity: tightness, depth and resiliency. Tightness refers to the difference between buying and selling prices. Depth relates to the size of trades possible without moving market prices. Resiliency denotes the speed with which prices return to normal following temporary order imbalances.

EONIA swaps are the most liquid segment of the euro money market ...

The available data indicate that euro swaps are one of the most liquid instruments available in euro financial markets. Indeed, EONIA swaps are the most liquid segment of the euro money market (ECB (2001a)). EONIA swaps of €2 billion are regularly traded in the inter-dealer market for maturities up to three months, and significantly larger trades are not uncommon. Bid-ask spreads are typically 1 basis point. The Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity shows that the average daily turnover of euro-denominated OTC interest rate contracts almost doubled between April 1998 and April 2001, to €231 billion (BIS (2002a)). By 2001, the turnover of euro swaps and forwards exceeded that of all interest rate products other than money market futures, US Treasuries and (probably) German government securities (Table 1). Trading in EONIA swaps appears to account for much of this growth.

... but government securities markets are more liquid at longer maturities

Beyond two years, however, the euro swap market is neither as tight nor as deep as the larger European government securities markets. Anecdotal evidence suggests that bid-ask spreads for euro swaps are wider than those for government securities: 1 basis point for inter-dealer swaps, compared to less than half a basis point for the most recently issued German government securities. Quote sizes are also smaller: approximately €100 million for five- and 10-year swaps, compared to at least €150 million for the most recently issued German bobls and bunds. Trading activity in longer-dated swaps is a fraction of that in futures contracts on German government bonds.

Liquidity in OTC markets is less robust to stress than on organised exchanges

Moreover, liquidity in the euro swap market appears more likely to evaporate during periods of extreme volatility than liquidity in the larger government securities markets. In particular, interest rate swaps remain less liquid than they would be if they were traded on an organised exchange, where a central clearing house could act as the counterparty to all trades. Counterparty credit risk becomes of paramount concern during periods of market volatility, when uncertainty about the health of financial institutions often increases. Consequently, arrangements for dealing with counterparty risk play a major role in determining market liquidity under stress (Borio (2000)). Assuming that the soundness of the clearing house is ensured, the liquidity of instruments traded on organised exchanges tends to be more robust to stress than that of instruments traded over the counter (Borio (2000), CGFS (1999)).

Steps have been taken to encourage greater centralisation in the swap market. In the early part of 2001, the London Clearing House, supported by several of the largest swap dealers, began clearing and settling interest rate swaps in all of the major currencies. At about the same time, LIFFE introduced futures contracts on two-, five- and 10-year euro swaps. However, trading of swap futures accounts for an insignificant proportion of global swap activity (Table 1). By contrast, trading of futures contracts on German government bonds accounts for the larger part of activity in the German government securities market.

The future of swaps

It remains unclear whether swaps will continue to erode the benchmark status of government securities and consolidate their position as the dominant positioning and hedging vehicles in euro fixed income markets. In addition to the previously mentioned concern about counterparty risk, another concern is that the participation of large, one-sided players, such as governments, could increase the risk of idiosyncratic movements in swap yields – ie it could increase basis risk – and so make swaps less effective hedges.

Repos could eventually compete with EONIA swaps for benchmark status at the short end of the euro yield curve, as they do in the US dollar market. European repo markets are growing rapidly and steadily becoming more integrated, boosted in large part by market participants' efforts to limit counterparty credit exposures. The development of a triparty repo market – in which settlement and management of the collateral is delegated to a central clearing house – is especially noteworthy because it allows a basket of securities to back a transaction, including lower-quality, less liquid securities (ECB (2002)). At the longer end of the yield curve, government securities remain attractive benchmark instruments, not least because of the tremendous liquidity of German government futures contracts.

European repo markets are becoming more integrated

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