9

Evolution of the Swap Contract

In one of its advertisements, Bankers Trust extolled the swap as "a tool no financial manager can ignore."[1] Although this statement has the ring of hyperbolic Madison Avenue prose, support for this view is provided by the volumes in the swap market. In Figure 9-1, we have provided volume estimates (notional principal outstanding) for currency and interest rate swaps for the period 1981–87. As this figure indicates, the volume of swaps has increased dramatically, particularly for interest rate swaps, since the introduction of the instrument in 1981.

However, this dramatic growth of the swap market is one of the few agreed-upon "facts" about the swap market. The rapid growth of the market has contributed to much confusion/misinformation/folklore about the "hows" and the "whys" of swaps.

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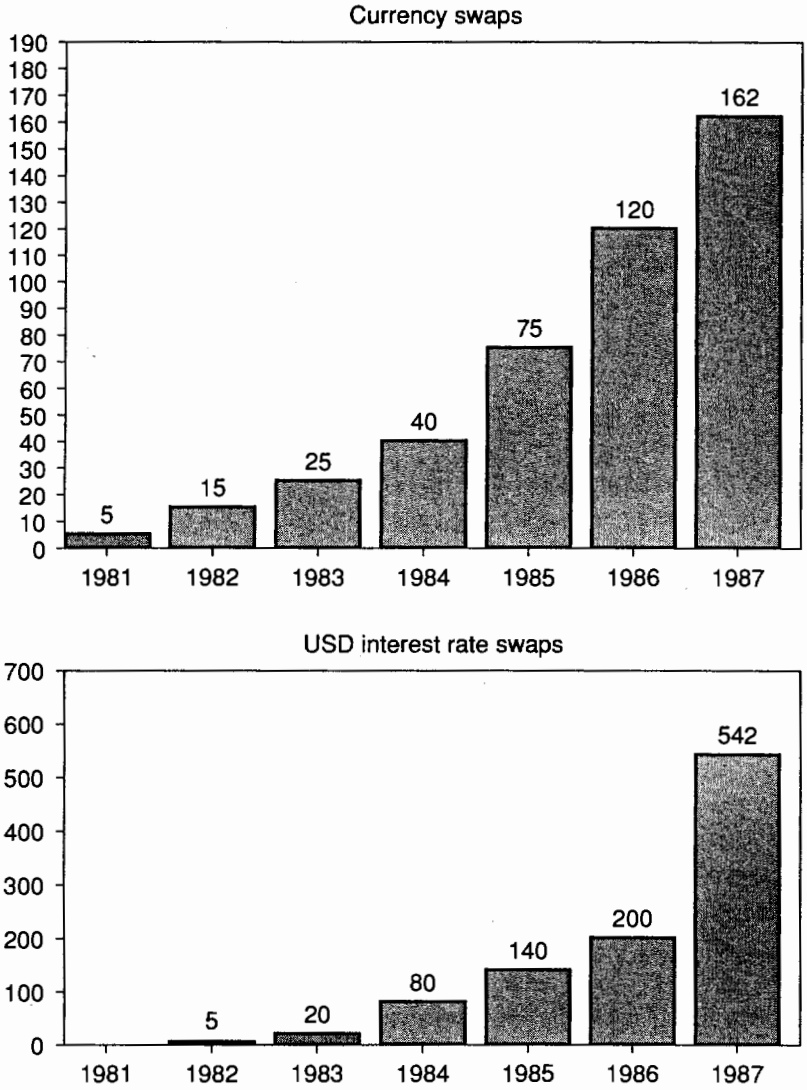
1. Bankers Trust Company, "The International Swap Market," advertising supplement to *Euromoney Corporate Finance* (September 1985).

In the development of the chapters on swaps, we are particularly indebted to Lee Macdonald Wakeman. Much of the material we used is taken from three papers Cliff and Charles co-authored with Lee: "The Evolving Market for Swaps," *Midland Corporate Finance Journal* 3, no. 4 (Winter 1986): pp. 20–32; "Credit Risk and the Scope of Regulation of Swaps," *Proceedings of the Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, 1987: pp. 166–185; and "The Market for Interest Rate Swaps," *Financial Management* 17, no. 4 (Winter 1988): 34–44. Moreover, much of our thinking—indeed, much of the thinking of the swaps market in general—on pricing and hedging swaps is based on Lee's work on the zero-coupon yield curve and hedging a book of swaps.

Figure 9-1. "Guesstimates" of Swap Volume Notional Principal Outstanding, 1981–87 (billion U.S. dollars).



The 1981–85 volume estimates are taken from Ronald Layard-Leisching, *Euromoney* (January 1986). (A similar series for interest rate swaps is provided by Jane Fant Nelson in the June 1986 issue of *United States Banker*.) The 1986 estimates were obtained in releases from the International Swaps Dealers Association. The 1987 estimates were reported in *Swaps Monitor* (July 25, 1988). There is at present no series of consistent swap volume estimates. A swap might go through several intermediaries before reaching the final counterparty, and each intermediary could report the swap in its volume. Thus, the aggregation of private estimates is likely to result in significant overstatement.

From Parallel Loans to Currency Swaps

As we described in Chapter 1, the 1970s brought increased foreign exchange risk to multinational companies due to the breakdown of the Bretton Woods accord in 1973. With elimination of the fixed exchange rates, the volatility of foreign exchange rates increased dramatically. Coupled with the prevailing accounting treatment of foreign-denominated assets and liabilities (SFAS 8), the increase in foreign exchange volatility produced massive swings in reported earnings. Indeed, these changes in reported earnings due to changes in the exchange rates were frequently greater than the changes resulting from operations. Hence, for firms with significant overseas operations, the effects of financial changes swamped the effects of real changes.

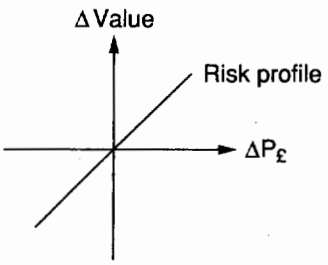
Consider, for example, the case of a U.S. company with a United Kingdom subsidiary. If the pound became more valuable (i.e., if the dollar price of a pound rose), the dollar value of the assets in the United Kingdom rose; thus, the U.S. parent was better off. The opposite would be true for a decline in the dollar price of a pound. This risk is summarized in Figure 9-2.

For a U.S. parent with a foreign subsidiary, this exposure to foreign exchange movements could be hedged through *parallel loan agreements*. In our example, the U.S. company and its U.K. subsidiary would be matched with a U.K. company that has a U.S. subsidiary. The U.S. company would make a dollar-denominated loan to the U.S. subsidiary of the U.K. company. Simultaneously, the U.K. company makes a pound-denominated loan of equal current value to the U.K. subsidiary of the U.S. firm.[2] As illustrated in Figure 9-3, the loans have parallel interest and principal repayment schedules.

This parallel loan would hedge the U.S. parent's exposure to dollar/pound movements. If the value of the pound should rise, the U.S. parent would suffer a loss on its pound-denominated loan, since it has a pound

2. The motivation for the U.S. firm to enter into this parallel loan agreement was to reduce the volatility of reported income (under SFAS 8). The U.K. firm was attracted to this transaction because the British government had (as had other governments) imposed controls on capital movements, in effect taxing the export of capital. These "capital controls" made it difficult for the U.K. parent to fund expansions in its U.S. subsidiary. By entering into the parallel loan agreement, the U.K. parent was able to bypass the capital controls and get funds to its U.S. subsidiary.

Figure 9-2. Risk Profile for a U.S. Company with a U.K. Subsidiary.



If a U.S. parent has assets in the United Kingdom, it faces risks due to movements in the price of the pound. If the dollar price of a pound ($P_£$) rises, the value of the assets in the United Kingdom rises. This raises the value of the U.S. parent through the increased reported earnings.

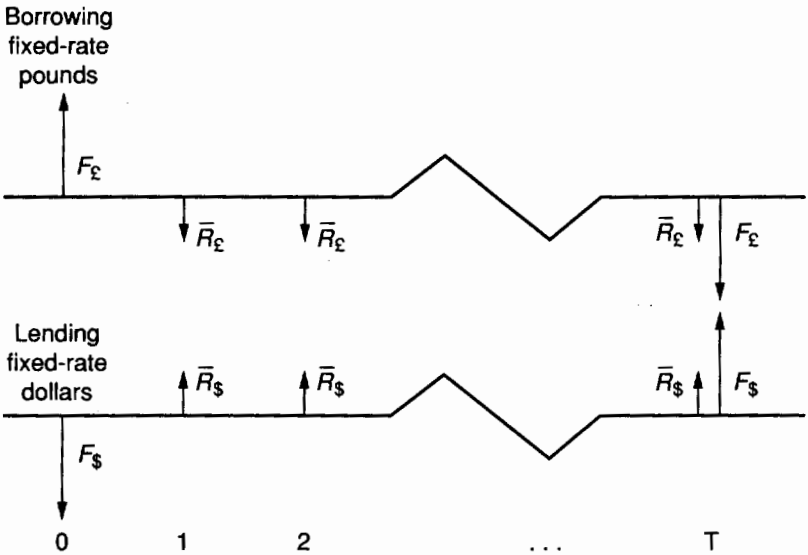
liability. Hence, the change in the value of the pound-denominated loan would move opposite that of the firm's inherent position. This relation is summarized in Figure 9-4.

There are, however, two major problems involved with the use of parallel loans:

1. Default risk: The loans are independent instruments, so default by one party does not release the counterparty from contractually obligated payments.
2. Balance sheet impact: If the balance sheets of the parent and its subsidiary have to be consolidated, the parallel loans will inflate the balance sheet (which leads to potential problems with financial covenants). Although the two loans effectively cancel each other out, they remain on the balance sheets for accounting and regulatory purposes.

The first problem can be managed simply by changing the structure from two independent instruments to a single instrument. Put another way, we

Figure 9-3. Cash Flows from a Parallel Loan Agreement.



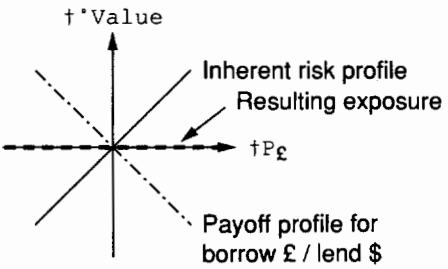
At a time 0, the U.S. firm, through its U.K. subsidiary, borrows pounds ($F_£$) at the prevailing T-period pound rate. At the same time, the U.S. firm loans to the U.S. subsidiary of the U.K. firm an equivalent current amount denominated in dollars at the T-period dollar rate. During the term of the loan, the U.S. firm makes interest payments in pounds ($R_£$) to the U.K. firm, which in turn makes interest payments in dollars ($R_\$$) to the U.S. firm. At maturity (time T) the two firms make their final interest payments and return the principals; the U.S. firm returns pounds and the U.K. firm returns dollars.

Note that inflows are denoted by upward arrows and outflows by downward arrows. The magnitude of the cash flow is indicated by the arrow's length.

"staple the two contracts together." The result is that the two sets of cash flows illustrated in Figure 9-3 become the single set of cash flows illustrated in Figure 9-5. The resulting instrument is a *currency swap*. As Figure 9-5 indicates, the counterparties to the swap contract have agreed to exchange—to swap—cash flows. The party illustrated in Figure 9-5 has agreed to pay a series of cash flows based on a fixed sterling interest rate in order to receive a series of cash flows based on a fixed dollar interest rate. The counterparty takes the reverse position.

By combining the parallel loans into a single legal document called a swap, the default risk has been reduced substantially. Default risk can further be reduced by *netting* the payments: At each of the *settlement*

Figure 9-4. Hedging a Foreign Exchange Exposure with a Parallel Loan.



The inherent risk profile is that for the U.S. parent in Figure 9-2. The payoff profile for borrow pounds/lend dollars is that which results from the parallel loan cash flows illustrated in Figure 9-3. If the U.S. parent matches the size of the parallel loan to the size of the inherent exposure, the dollar/pound exposure could be eliminated.

dates 1, 2, . . . , T, it is not necessary for the party illustrated in Figure 9-5 to pay $\overline{R}_{£}$ and receive $\overline{R}_{\$}$. Instead, the two parties can exchange a *difference check*. If the value of sterling rises, the party illustrated in Figure 9-5 pays a difference check to the counterparty; if the value of sterling falls, the party illustrated in Figure 9-5 receives a difference check.

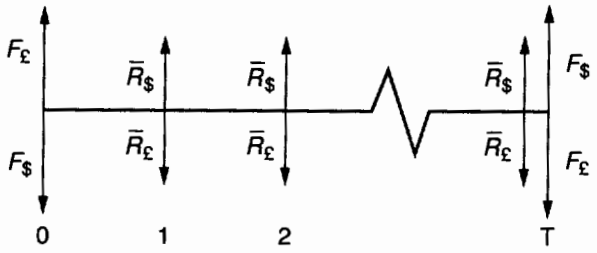
The second problem, the impact on the balance sheet, is handled even more simply: Current accounting and regulatory practices treat swaps as off-balance-sheet instruments. Therefore, the swap will not "blow up" the firm's balance sheet.

Thus, the currency swap evolved directly from the parallel loan agreement. Although privately arranged swaps existed in the mid-1970s, the public introduction of swaps is normally marked with the currency swap between IBM and the World Bank in 1981.

From Currency Swaps to . . .

From the currency swap evolved other kinds of swaps. As we have seen, the currency swap involves the exchange of a fixed-rate cash flow in one

Figure 9-5. Making a Parallel Loan Agreement into a Single Instrument: Creating a Currency Swap.



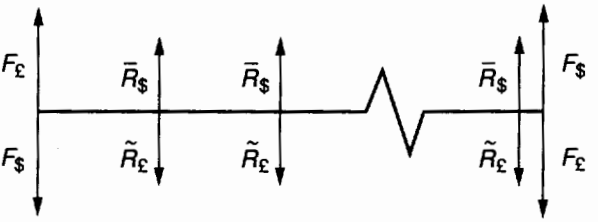
The two sets of cash flows illustrated in Figure 9-3 have been combined. The resulting cash flows are those for a *currency swap*.

currency for a fixed-rate cash flow in another. As shown in Figure 9-6, it is a simple matter to replace one of the fixed-rate cash flows with a floating-rate cash flow. The resulting instrument is referred to as a *currency coupon swap*.[3]

A special case of a currency coupon swap occurs when both currencies are the same. As illustrated in Figure 9-7, the result is an *interest rate swap*. As noted previously, the initial principal exchange in a swap is

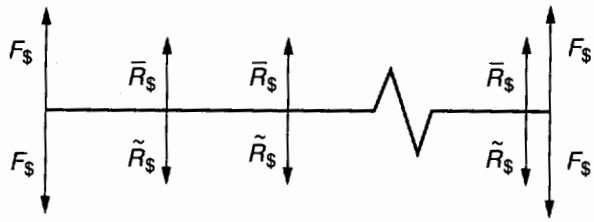
3. Alternatively, this construction is known as a *cross-currency interest rate swap*.

Figure 9-6. A Currency Swap Converted to a Currency Coupon Swap.



A swap of a fixed-rate cash flow ($\bar{R}_\$$) in one currency for a floating-rate cash flow ($\tilde{R}_£$) in another currency is called a *currency coupon swap*.

Figure 9-7. A Currency Coupon Swap Converted to an Interest Rate Swap.

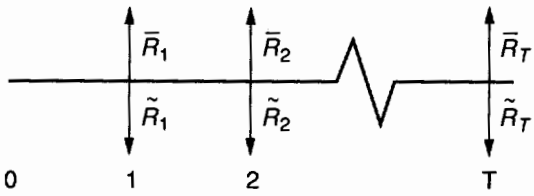


If all the cash flows in a currency coupon swap are paid in the same currency, the result is an *interest rate swap.*

not necessary. For an interest rate swap, all of the principal amounts are expressed in the same currency units. This means that the re-exchange at maturity is also not necessary. Therefore, we can illustrate the interest rate swap as in Figure 9-8.

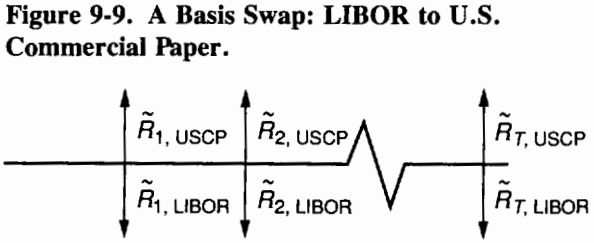
In an interest rate swap, the cash flows are determined by one fixed interest rate and one floating interest rate (both in the same currency). In a *basis-rate swap,* both interest rates are floating (again, both in the same currency). Thus, the basis swap permits floating-rate cash flows calculated on one basis to be exchanged for floating-rate cash flows calculated on another. For example, it permits firms to convert from six-month LIBOR (London Inter Bank Offer Rate) to one-month U.S.

Figure 9-8. An Interest Rate Swap: Cash Flows for a Floating-Rate Payor.



The counterparty illustrated receives a series of cash flows determined by the T-period fixed interest rate ($\bar{R}_t$) at origination, in return paying a series of cash flows ($\tilde{R}_t$) determined by the relevant floating interest rate, reset at the beginning of every period.

Figure 9-9. A Basis Swap: LIBOR to U.S. Commercial Paper.



The party illustrated receives semiannual cash flows based on the compounded one-month U.S. commercial paper rates, while paying cash flows determined by six-month LIBOR rates.

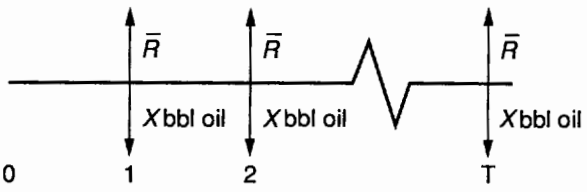
commercial paper rates. Such a swap is illustrated in Figure 9-9, which suggests that a basis-rate swap is equivalent to pairing two simple interest rate swaps. The flows are converted from floating to fixed, and then converted from fixed to floating (but on a different basis).

A swap is, in effect, an exchange of cash flows calculated to reflect changes in designated prices. So far, we have considered only two prices: interest rates and exchange rates. However, swaps defined in prices other than interest rates and foreign exchange rates are also possible. Once a principal amount is determined and that principal is contractually converted to a flow, any set of prices can be used to calculate the cash flows.

Consider, for example, the possibility of swaps denoted in commodities such as wheat. The counterparties could agree to exchange a stipulated number of dollars for a specified number of bushels of wheat on specified dates. Such a swap is analytically no different from a fixed currency swap where prices of wheat replace the currency prices. In addition, neither firm need be in the wheat business; the difference checks are paid in dollars, not wheat. Moreover, in a swap in which the firm elects to pay with wheat, it can receive either fixed or floating rates in any currency or commodity.

Although wheat swaps have not yet appeared, oil swaps have. Figure 9-10 illustrates the cash flows for a party who receives cash flows based on a fixed U.S. dollar interest rate and pays cash flows determined by the price of oil. Note again that while the cash flows are expressed in terms of oil, no physical quantities of oil need be involved. At the settlement date, the difference check paid or received would reflect the

Figure 9-10. An Oil Swap.



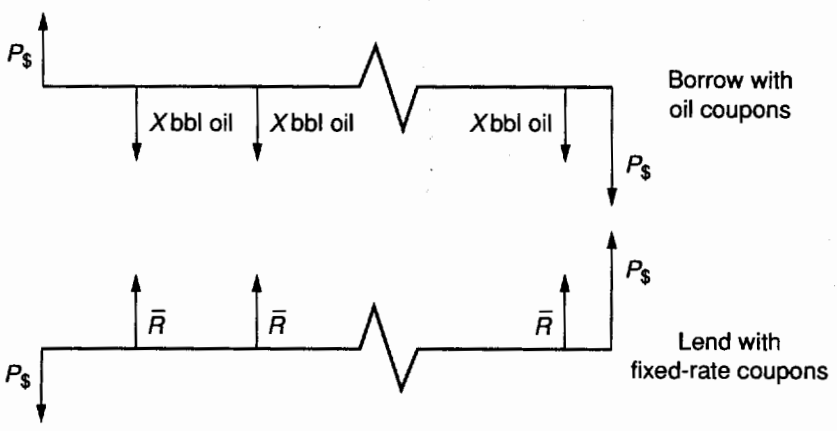
price of oil. If oil prices have risen since contract origination, the party illustrated in Figure 9-10 would pay a net difference check; if oil prices have fallen, he or she would receive the check.

Note also that the commodity swap can, like any of the other swaps, be decomposed into long and short positions in loans (i.e., lending and borrowing). For example, the oil swap illustrated in Figure 9-10 can be decomposed into lending with standard fixed-rate coupon payments and simultaneously borrowing the same amount where the coupon payments are expressed in terms of oil. Figure 9-11 illustrates this situation.

Given the range of swaps we have described, it is not surprising to hear market participants assert that "the future potential structures . . . are limited only by the imagination and ingenuity of those participating in the market."[4]

4. Bankers Trust Company, *op. cit.* p. 2.

Figure 9-11. Decomposing an Oil Swap into Two Loan Products.



Development of the Swap Market

A picture of the historical development of the swap market can be obtained by looking either at the evolution of the products or at changes in the market's participants. Both tell the same story. We first look at the products.

As we noted, currency swaps were the first to appear. The earliest swaps were done on a one-off basis, which involved a search for matching counterparties—matching not only in the currencies, but also in the principal amounts and timing desired. These early swaps were custom-tailored products. Because the deals were all one-off, they involved a great deal of work by the financial institution arranging the swap. However—and this is a crucial point—they involved virtually no direct exposure for the broker. In the language of the market participants, the early swaps required "creative problem solving" rather than capital commitment from the intermediary.

As interest rate swaps began to appear, the movement toward a more standardized product began. With the U.S. dollar interest rate swaps, there were fewer areas in which counterparties had to match than was the case for currency swaps. The product had become more homogeneous, so there was less demand for one-off deals. Instead of looking for one exactly matching counterparty, the intermediary could look for a number of counterparties that together matched the notional principal.

With the move toward homogeneity and the reduced reliance on an identifiable counterparty, markets for swaps—in particular, interest rate swaps—began to look more and more like markets for commodities. Increased competition forced down the spreads. And with the increased competition, an extensive search for a counterparty or group of counterparties proved unprofitable for the intermediary. Instead, the intermediaries began to accept swap contracts without a counterparty, taking the interest rate risk into their own books and hedging it with interest rate futures or U.S. treasuries until it could be matched with an offsetting position.

Hence, the evolution of the products offered in the swaps market paralleled that of most markets. Swaps evolved from a customized, client-specific product to a standardized product. With the customized product, the role of the intermediary had been one of problem solving. As the product became more standardized, the role of the intermediary changed considerably, with less emphasis on arranging the deal and more on transactional efficiency and capital commitment.

As for the participants in the swaps market, the dominant intermediaries in the early stage of development were investment banks. As the market evolved, the entrants into this market changed to more highly capitalized firms, in particular commercial banks. The evolution of the role of the intermediary mirrors the change in the products. In the early stages, the emphasis was on the intermediary arranging the transaction rather than accepting risk from the transaction; thus, investment banks were the natural intermediaries. But as the swaps became more standardized, it became essential for the intermediary to be willing and able to accept part or all of a potential transaction into its books. Hence, commercial banks, with their greater capitalization, became a more significant factor.

One way of illustrating the dominance of commercial banks for U.S. dollar interest rate swaps is to look at the size of their swap books. Table 9-1 provides the notional principal outstanding for the ten largest interest rate swap dealers. Although aggregation necessarily involves some double-counting, it is useful to note that the aggregate notional

Table 9-1. Notional Principal Outstanding for Interest Rate Swaps (as of September 30, 1988).

Ranks by Swaps Notional Principal		Notional Principal Outstanding ($ billions)	Total Assets ($ billions)	Rank by Assets
1	Chemical Bank	148.5	69.8	7
2	Citicorp	130.3	209.2	1
3	Bankers Trust	108.5	57.9	9
4	Manufacturers Hanover	86.2	74.0	6
5	Chase Manhattan	75.7	97.4	2
6	J.P. Morgan	64.8	82.1	4
7	Security Pacific	62.4	78.9	5
8	First Chicago	27.6	45.1	10
9	BankAmerica	23.7	95.2	3
10	First Interstate	19.3	58.0	8

Sources: Notional Value of Swaps Outstanding from BankBase One database, Newport Associates, Ltd. Bank Holding Company Ranking by Asset Sizes printed with permission of Shesnunoff Information Services, Inc. Copyright © 1988 by Shesnunoff Information Services, Inc., Austin, Texas. The foregone information appears in Cd/Banking, a One Source Product of Lotus Development Coporation.

Table 9-2. *Euromoney* Survey of Swap Users.

	Keenest Pricing on Straight Dollar Interest Rate Swap		Best Overall		Keenest Pricing on Cross-Currency Swaps
1	Citicorp	1	Security Pacific	1	Citicorp
2	Security Pacific	2	Bankers Trust	2	Bankers Trust
3	Bankers Trust	3	Citicorp	3	Morgan Guaranty
4	Chase Manhattan	4	Morgan Guaranty	4	Banque Paribus
5	Morgan Guaranty	5	Banque Paribus	5	Chase Manhattan
6	Chemical Bank	6	Chemical Bank	6	Credit Suisse First Boston
7	CIBC	7	Chase Manhattan	7	Salomon Brothers
8=	Credit Suisse First Boston	8=	Deutsche Bank	8	SBCI
8=	Banque Paribus	8=	Salomon Brothers	9	Union Bank of Switzerland
10	Merrill Lynch	10	SBCI	10	Manufacturers Hanover

Source: "Sepac Graduates Into the Big Time," *Euromoney* (September 1988): p. 216. Used with permission.

principal outstanding of these ten commercial banks amounts to $677.4 billion. Another way of ascertaining the dominance of commercial banks in swaps is to solicit the opinions of swaps users. On an annual basis, *Euromoney* surveys the views of some 100 of the largest users of swaps worldwide. The results of the most recent survey, reproduced in Table 9-2 on page 211, support the notion that the commercial banks have become dominant in this market.

Standardization has played a large part in the growth of swaps. One market observer put it well by noting that "swaps have become a high volume, lower margin business, rather than the personalized, corporate financial deal of the past."[5] As we have pointed out, the standardization has been easier for interest rate swaps, which may go a long way toward explaining why this market has grown more rapidly than that for currency swaps.

The growth of the swap market also corresponds to the expanding liquidity available through the secondary market. Swap positions can be traded (i.e., the swap contract is "assigned" to a third party), and this market is growing. However, much of the secondary market in swaps involves the reversing (unwinding) of a position. The simplest method for unwinding a swap involves a cancellation of the agreement, with a final difference check determined by the remaining value of the contract. Alternatively, the swap can be unwound by writing a "mirror" swap to cancel out the original. Most market observers indicate that the secondary market is sufficiently deep to decrease risks in the primary market, particularly for short-term swaps.

In the primary swaps market, the most liquid market is for U.S. dollar interest rate swaps. According to the International Swap Dealers Association, the average interest rate swap has a maturity of three to five years with a notional principal of $25 million. However, a market now exists for dollar interest rate swaps of up to ten-year maturities and amounts to $1 billion.

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5. K. Henderson Schuyler, "The Constraints on Trading Swaps," *Euromoney* (May 1985): 63–64.