THE EVOLVING MARKET FOR SWAPS

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A recent advertisement extols swaps as "a tool no financial manager can ignore."[1] While this statement has the hyperbolic ring of Madison Avenue prose, it is nevertheless quite clear that the swaps market — a relatively new and rapidly developing market — has become increasingly important. As with other evolving markets in the past, there exists confusion about certain economic implications of this market, especially among some corporate treasurers to whom these instruments are being marketed. Questions that deserve consideration include: (1) How does the swaps market relate to other financial markets? (2) How (and why) did the swaps market evolve? (3) What goes into the pricing of a swap, particularly the evaluation of credit risk? (4) What direction might the swaps market be expected to take in the future? Our paper focuses on these questions; and, in so doing, it proposes a general analytical framework that should prove helpful in evaluating both the broad variety of swaps now available, and those that are yet to be devised.

Analysis of Swap Transactions

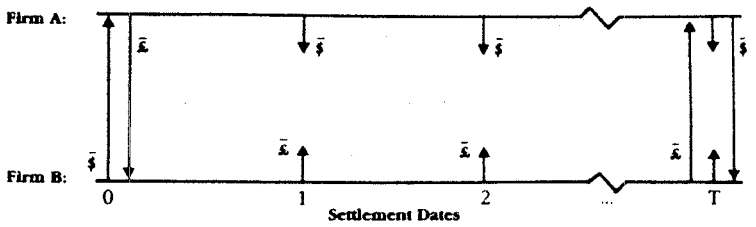
As its name implies, a swap is normally defined as an exchange. More specifically, it is an exchange of cash flows over time between two parties (generally referred to as the "counterparties"). The first swaps developed from parallel loans arranged between two companies in different countries, a form popular in the 1970s. To illustrate a parallel loan, suppose a British company makes a loan denominated in pounds to a US company, which in turn makes a loan of equal value denominated in dollars to the British company. As illustrated in Figure 1, these loans have parallel interest and principal repayment schedules. By entering into this parallel loan agreement, the British company is able to transform a debt incurred in pounds into a fully-hedged US dollar liability. There are, however, two potentially important problems with parallel loans: (1) default by one party does not release the other from making its contractually obligated payments; (2) although the loans effectively cancel one another, they remain on-balance-sheet items for accounting and regulatory purposes. Early in the 1980s a new transaction known as a "currency swap" was devised to overcome these problems; and because of its success, it effectively displaced the use of parallel loans.

The Currency Swap. A currency swap involves the same pattern of cash flows as a parallel loan. Indeed, without any modification, Figure 1 could be used to illustrate the cash flows for a fixed currency swap where firm A pays a fixed interest rate in dollars and receives a fixed rate in pounds, while the counterparty, firm B, pays fixed-rate pounds and receives fixed-rate dollars. (In this context, the short arrows in Figure 1 denote the cashflows exchanged during the term of the agreement, while the long arrows denote the initial exchange of principals at time 0 and the reexchange at maturity, time T.) Alternatively, a swap transaction could be illustrated by looking at the cash flows paid and received over time by one of the counterparties. Figure 2 illustrates the position of the British firm A in this fixed currency swap.

Although a swap is defined as an "exchange" of cash flows, there need not be an actual exchange of payments. Instead, at specified intervals, only the net

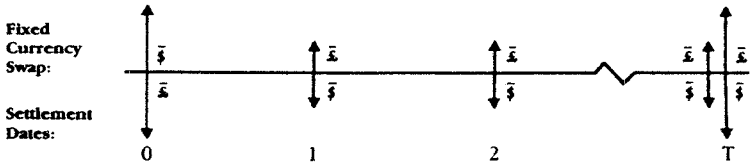
1 Bankers Trust Company, "The International Swap Market," Advertising Supplement to *Euromoney Corporate Finance*, September 1985

FIGURE 1
Cash Flows in a Parallel Loan Agreement



The British firm A simultaneously borrows dollars from American firm B and loans an equivalent amount denominated in pounds to firm B at time 0. During the term of the loan, firm A makes interest payments in dollars to firm B, while firm B makes interest payments in pounds to firm A. At maturity (time T) the two firms make their final interest payments and return the principals. Firm A returns dollars and firm B returns pounds.

FIGURE 2
Cash Flows from a Fixed Currency Swap



The British firm A pays interest at a fixed dollar rate ($\bar{\$}$) and receives interest at a fixed pound rate ($\bar{£}$). The long arrows denote the initial exchange of principal and the reexchange at maturity; the short arrows denote the cash flows exchanged over the course of the agreement.*

cash flows could be exchanged, and the party that would have received the lower of the cash flows could simply pay the other the difference in the two cash flows. In the case of currency swaps, the counterparties do exchange interest payments; however, the exchange is conditional in the sense that if one party defaults, the other is released from its obligation. In currency swaps, moreover, the counterparties generally exchange the principals at an agreed-upon rate of exchange and then reexchange at the end of the agreement; but this exchange also need not occur. The principal could instead be "notional," as is generally the case in interest rate swaps (which we take up later).

By thus converting the older parallel loan transaction into a conditional exchange of the cash flows, the currency swap reduces the probability and magnitude of default. Furthermore, as implied above, current regulatory and accounting practice treats swap contracts as off-balance-sheet items. Thus, as stated earlier, the currency swap accomplishes the goals of its predecessor, the parallel loan agreement, while eliminating the major remaining problems with that transaction.

Swaps as Packages of Forward Contracts. One of the major themes of this paper, to which we shall return throughout, is the fundamental similarity between swaps and forward contracts. In fact, it is our contention that any swap can be decomposed into a series of forward contracts.

Again consider Figure 2, which illustrates the cash flows in a fixed currency swap — one in which the firm pays fixed-rate interest in one currency and receives fixed-rate interest in another. The cash flows for the counterparty receiving pounds and paying dollars at time 1 are equivalent to those from holding

*In this figure and in similar figures to follow, we adopt the convention of showing inflows above the line and outflows below the line.

We believe this decomposition of swaps into forward contracts is the most productive way of evaluating swaps, particularly the pricing of swaps.

a long position in pounds in a pound-dollar forward contract. This also applies to each settlement date between 2 and T; hence this currency swap for firm A is equivalent to a package of T long forward contracts in pounds. The positions are reversed for the counterparty.

We believe this decomposition of swaps into forward contracts is the most productive way of evaluating swaps, particularly the pricing of swaps. Simple swaps have been standardized and are now quoted virtually as commodities; and for such swaps this method of analysis will seem roundabout. But, as we will demonstrate, for more complicated swaps, where the timing of cash-flow exchanges differ or where the principal changes, decomposition of cash flows into forward contracts is the simplest, most effective analytical approach.

Currency Coupon Swaps. In a currency swap, as we have seen, the counterparties agree on the timing of the exchanges, the principal amounts of the currencies that will be exchanged, the interest rates (which reflect credit market forward prices) that will determine the future cash flows, and the exchange rates used to calculate the net cash flows. The earliest currency swaps were fixed currency swaps, which specified fixed interest rates in both currencies. Soon after came a variant of the fixed currency swap called the currency coupon swap. In such an arrangement, the interest rate in one currency is fixed and the other is floating.

Interest Rate Swaps. The interest rate swap, which was introduced shortly after currency swaps, is a special case of the currency coupon swap — one in which all the cash flows are denominated in a single currency. Figure 3 illustrates a simple interest rate swap. The primary difference between Figures 2 and 3 is that the exchanges of principal flows at time 0 and T net to zero because they are of the same amount and denominated in the same currency.

Basis Rate Swaps. To this point, we have described swaps in which both interest rates are fixed (fixed currency swaps) and swaps in which one interest rate is fixed and one is floating (simple interest rate swaps and currency coupon swaps). In a basis rate swap, both interest rates are floating. The primary effect of such swaps is to allow 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 make conversions from one-month LIBOR to six-month LIBOR, or from LIBOR to US commercial paper rates. A basis rate swap is equivalent to pairing two simple interest rate swaps such that the flows are converted from floating to fixed, and then converted from fixed to floating (but on a different basis).

Commodity Swaps. A swap is, in effect, an exchange of net 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 contractually converted to a flow, any set of forward prices can be used to calculate the cash flows (and thus the difference checks).

Consider, for example, the possibility of swaps denoted in commodities such as oil and wheat. The counterparties could agree to some notional principal and to the conversion of this principal to flows using a fixed dollar interest rate and the US price of wheat. Such a swap is analytically no different from a currency swap where forward prices of wheat replace the forward 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.

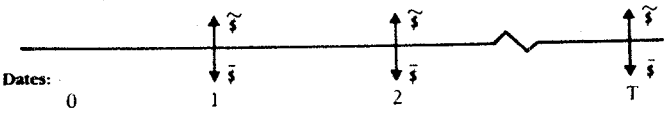
Swaps with Timing Mismatches. In addition to differences resulting from the price used to calculate the cash flows (i.e., interest rates, foreign exchange rates, and commodity prices), swaps can differ in the timing of the cash flows. At the simplest level, it could be that one party is paying on a monthly basis while the other is on a quarterly schedule. More significant differences in the timing of the cash flows include so-called "zero" swaps — swaps in which one party makes no payment until maturity — and customized swaps in which the payments from one party vary, either in terms of timing or amount.

Swaps with Option-Like Payoffs. We have stressed the similarity of swaps to forward contracts. Indeed, the payoff profile for a simple swap contract is identical to that of a forward contract. Fig. 4 presents a simple case in which the firm pays a floating interest rate and receives a fixed rate. This firm has positive net cash flows when the short-term interest rate is below that existing at the contract origination date.

Swaps can also be constructed so as to have option-like provisions which limit the range of outcomes. For example, suppose that a firm with a

Swaps defined in prices other than interest rates and foreign exchange rates are clearly possible. Once a principal amount is determined and that principal converted to a flow, any set of forward prices can be used to calculate the net cash flows.

FIGURE 3
Cash Flows in an Interest Rate Swap



The firm illustrated pays a fixed dollar interest rate ($\bar{\$}$) and receives interest computed on a floating dollar rate ($\tilde{\$}$). The counterparty pays floating and receives fixed.

FIGURE 4
Payoff Profile of an Interest Rate Swap for Firm Paying Floating Rate and Receiving Fixed Rate

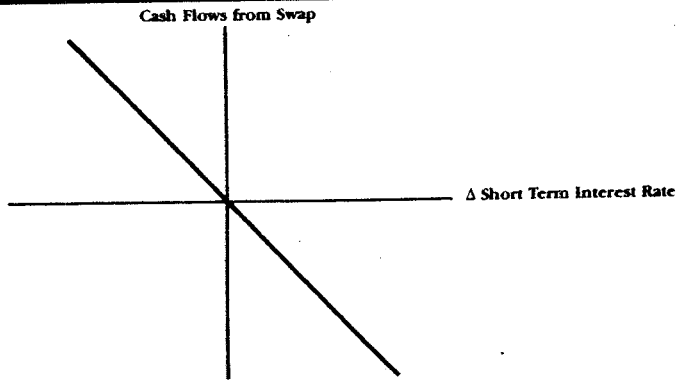
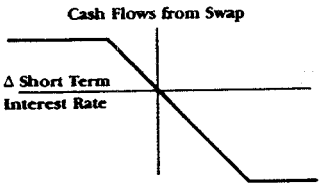


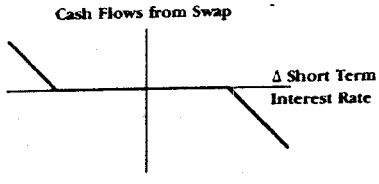
FIGURE 5
Pay-off Profile for Floor-Ceiling Swaps

Panel A: Floating Floor-Ceiling Swap



Firm receives a fixed rate and pays a floating rate between the limits set by the floor and ceiling rates.

Panel B: Fixed Floor-Ceiling Swap



Firm receives a fixed rate and pays a fixed rate between the limits set by the floor and ceiling rates.

floating-rate liability wanted to limit its outflows should interest rates rise substantially and was willing to give up some potential gains should there instead be a dramatic decline in short-term rates. To achieve this end the firm could modify a simple interest rate swap contract to read as follows: As long as the interest rate neither rises by 200 basis points nor falls more than 100 basis points, the firm pays a floating rate and receives a fixed rate; but, if the interest is more than 200 basis points above or 100 basis points below the current rate, the firm receives and pays a fixed rate. The resulting payoff profile for this floating floor-ceiling swap is illustrated in Panel A of Figure 5. (It is also the payoff profile for a "spread.")[2]

2 Note also that if the floor and ceiling rates are equal this side of the contract is equivalent to a fixed rate obligation since a long call plus a short put with the same terms equals a long forward contract.

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Conversely, the contract could have been modified as follows: As long as the interest rate is within 200 basis points of the current rate, the firm receives and pays a fixed rate; but if the interest rate rises or falls by more than 200 basis points, the firm pays a floating rate and receives a fixed rate. The payoff profile for the resulting fixed floor-ceiling swap is illustrated in panel B of Figure 5.

Given the range of swaps described above, we agree with the market participant who noted that "the future potential structures....are limited only by the imagination and ingenuity of those participating in the market."[3]

Development of the Swaps Market

The swaps market is still relatively new. As we noted, its origins can be traced to the parallel loan products of the 1970s. However, a market for swaps did not exist in any meaningful sense until the 1980s. Currency swaps are slightly older than interest rate swaps; their public introduction was the World Bank-IBM transaction in August 1981. US dollar-denominated interest rate swaps started in 1982. While not as old as the currency swaps market, the US interest rate swaps market is now the largest of the swaps markets.

Given the growth in swaps that has occurred, there are two questions we want to consider in this section: (1) Since swaps are so similar to forward contracts, WHY did this market evolve? (2) In order to provide a framework for looking at the future of this market, what path has the evolution of this market followed so far — HOW did this market evolve?

Why Did the Swaps Market Evolve?

Trade journals and market participants agree that the growth of the swaps market has resulted from the ability to receive "significant cost savings" by combining a bond issue with a swap.[4] Using swaps, the firm ends up with lower borrowing costs than it could have obtained with a single transaction. For example, with the use of swaps, companies have obtained funding at LIBOR minus 75-100 basis points. Obviously, a satisfying explanation of why the swaps market evolved must identify the source of this cost saving.

Financial Arbitrage. The popular argument seems to be that the cost savings is based on some kind of financial arbitrage across different capital markets. That is, prices in various world capital markets are not mutually consistent; and firms can lower their borrowing costs by going to foreign capital markets with lower rates, borrowing there, and then swapping their exposure back into their domestic currency, thereby ending with cheaper funding than that obtainable from simply borrowing at home.

The problem with this argument, however, is that the very process of exploiting this kind of opportunity should soon eliminate it. The opening and expansion of a swap market effectively increases the demand for loans in low-rate markets and reduces the demand in higher-rate markets, thereby eliminating the supposed rate differences. Moreover, if this were the only economic basis for swaps, the benefits to one party would come at the expense of the other. Thus, in reasonably efficient and integrated world capital markets, it seems difficult to attribute the continuing growth of the swaps market simply to interest rate differences, and thus financial arbitrage, among world capital markets.

Tax and Regulatory Arbitrage. Swaps allow companies to engage in what might be termed tax and regulatory arbitrage. Prior to the existence of a well-functioning swap market, a firm issuing dollar-denominated, fixed-rate bonds generally did so in US capital markets and thus had to comply with US securities regulation. Moreover, the issuing firm, as well as the security purchasers, were generally faced with the provisions of the US tax code. The introduction of the swap market allows an "unbundling," in effect, of currency and interest rate exposure from the regulation and tax rules in some very creative ways. For example, with the introduction of swaps, a US firm could issue a yen-denominated issue in the Eurobond market, structure the issue so as to receive favorable tax treatment under the Japanese tax code, avoid much of the US securities regulation, and yet still manage its currency exposure by swapping the transaction back into dollars. Unlike the classic financial arbitrage de-

3. Bankers Trust Company, "The International Swap Market," cited earlier.
4. As an example of the popular literature on swaps, see Tanya S. Arnold, "How to Do Interest Rate Swaps," *Harvard Business Review*, September-October 1984, pp.96-101.

Unlike classic financial arbitrage, there is no reason for opportunities for tax or regulatory arbitrage to disappear (barring changes, of course, in the various tax and regulatory codes).

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To illustrate the manner in which tax and regulatory arbitrage induces swaps, consider the way one US firm used swaps to take advantage of special tax and regulatory conditions in Japan:

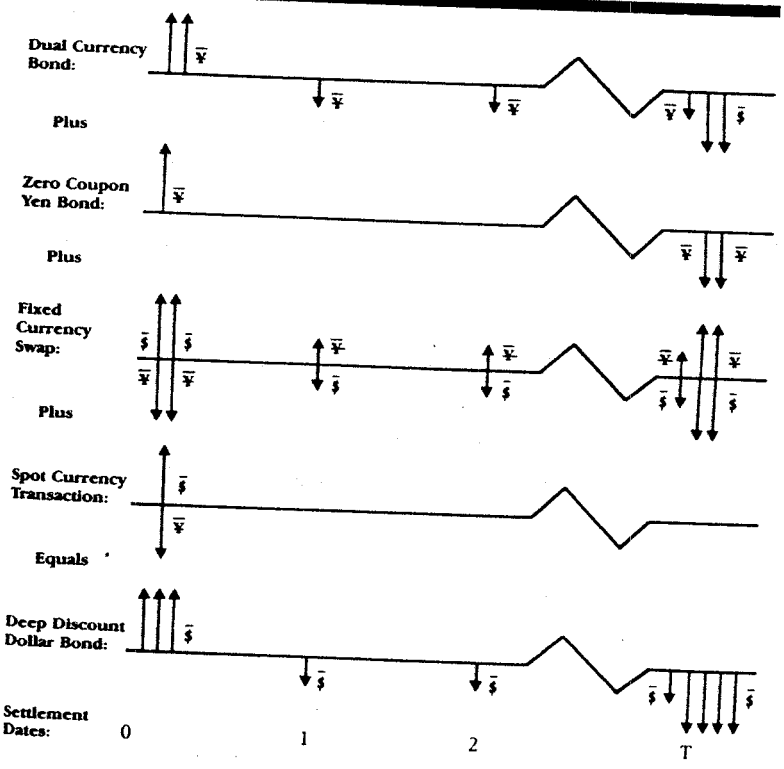
(1) Until recently, zero coupon bonds received extremely favorable treatment under the Japanese tax code: taxes were not due until maturity, and at maturity the difference between the purchase price and the face value of the bond was taxed at the capital gains rate.

(2) The Ministry of Finance limited the amount a pension fund could invest in non-yen-denominated bonds issued by foreign corporations to at most 10% of their portfolio.

In response to these conditions, a US firm issued a zero coupon yen bond plus a dual currency bond with interest payments in yen and principal repayment in dollars. The zero coupon yen bond permitted the firm to take advantage of the tax treatment of yen zeros. The Ministry of Finance ruled that the dual currency bonds qualified as a yen issue for purposes of the 10% rule, even though the dual currency bond has embedded within it a dollar-denominated zero. Hence, by issuing the dual currency bond, the US firm was able to capitalize on the desire of Japanese pension funds to diversify their portfolios internationally, while at the same time adhering to the regulation imposed by the Ministry of Finance.

The same US firm also, however, wanted to transform its resulting yen exposure to a US dollar expo-

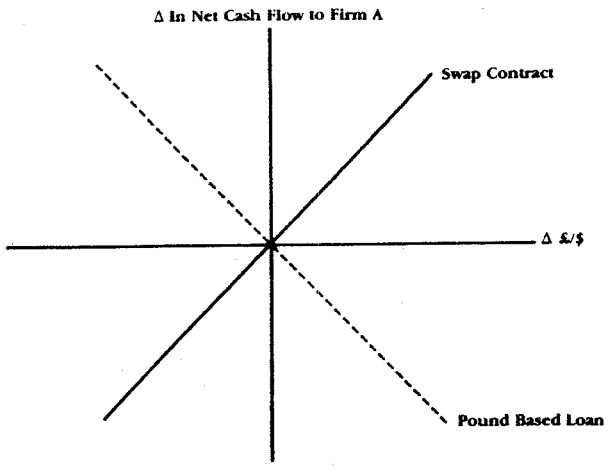
FIGURE 6
Cash Flows in a Dual Currency Bond Issue Plus a Zero Coupon Yen Issue Combined with a Fixed Currency Swap and Spot Currency Transaction



The final cash flows are equivalent to those of a deep discount dollar bond.

The swap market can be used as a way of synthetically "completing" the financial markets.

FIGURE 7
Payoff Profile of a Currency Swap Used to Hedge the Financial Risk Exposure from its Underlying Business



The dashed line represents the exposure of the firm's net cash flow to changes in the £/$ exchange rate without hedging. The payoff profile for the swap is the solid line. Thus, after the swap, the firm is completely hedged against changes in this exchange rate.

sure. To transform the bond issues, the firm used a currency swap together with a spot $/¥ transaction. (There is less liquidity in non-standard, annuity-type swaps. By combining the principal repayment of the yen zero with the coupon payments of the dual currency bond, a standard, bond-type swap could be used to hedge.) The resulting cash flows are solely in dollars (see Figure 6). Indeed, the swap transaction has created a synthetic deep discount dollar bond, and the rates were such that the firm lowered its total borrowing costs. By using the swap transaction, the firm capitalized on both the favorable regulatory ruling concerning dual currency bonds and the favorable tax treatment of zero coupon bonds, while retaining a fixed dollar interest rate exposure.

Exposure Management. Swaps also allow firms to lower the transactions costs of managing their exposure to interest rates, currency prices, or commodity prices. As we noted, a fixed currency swap can be used by a firm to transform a debt incurred in pounds into a dollar liability. This transformation is illustrated in Figure 7. The payoff profile for a loan incurred in pounds relative to changes in the £/$ exchange rate is shown as the dashed line. The payoff profile for the swap is shown as the solid line. Viewed in this context, the swap contract behaves like a conventional long-dated foreign exchange forward contract; losses on the dollar-based loan resulting from exchange rate changes will be offset by gains on the swap contract.

For example, consider the case of a firm just entering a foreign market. Although well-known at home, the company might have difficulty placing debt in the foreign credit market where access to information about the firm is more expensive. In this case, it might be less expensive to issue debt in domestic capital markets and swap into the foreign currency exposure.

Conversely, suppose a firm's cash flow exposure in Deutschemarks declines, reducing the amount of DM-denominated debt desired in the firm's balance sheet. Without swaps, the firm would have to call outstanding DM bonds to manage its exposure, an expensive alternative if German interest rates have risen. With access to a liquid swap market, the firm may have a lower-cost means of reducing its DM-denominated liabilities.[5]

Completing Markets. Finally, the swaps

5. For discussions of corporate motives for hedging, see David Mayers and Clifford Smith, "The Corporate Insurance Decision," *Chase Financial Quarterly* (Spring 1982), and "Corporate Insurance and the Underinvestment Problem," Working Paper, The University of Rochester Managerial Economics Research Center, 1985. See also Clifford Smith and Rene Stulz, "The Determinants of Firms' Hedging Policies," *Journal of Financial and Qualitative Analysis*, December 1985, and Alan Shapiro and Sheridan Titman, "An Integrated Approach to Corporate Risk Management," *Midland Corporate Finance Journal* (Summer 1985).

As the product became more standardized, the intermediaries began to accept swap contracts without a counterparty, taking the risk into their own books.

market contributes to the integration of financial markets by allowing market participants to fill gaps left by missing markets. An obvious gap filled by the swaps market is the forward market in interest rates. Until recently, there were no forward interest rate contracts available. But, because an interest rate swap behaves like a series of forward contracts, a swap could be used in place of the missing forward contract. Hence, the swap market can be used as a way of synthetically "completing" the financial markets.

Less obvious is the manner in which currency and interest rates swaps have been used to fill gaps in the international financial markets. For example, there is no Swiss Treasury Bill market. Currency and interest rate swaps, however, can be used to create this market synthetically.

In sum, there are four primary reasons WHY the swaps market evolved: (1) classic financial arbitrage opportunities; (2) profit opportunities from regulatory and tax arbitrage; (3) lower transaction costs for some types of financial risk exposure management; and (4) financial market integration. It appears that the first of these is significantly less important today than when swaps markets first opened. Spreads which were initially available have been substantially reduced by the very process of financial arbitrage which produced the original cost savings. As one market observer has commented,

"...at the outset of the market, a 'AAA' issuer could reasonably expect to achieve 75-100 basis points below LIBOR on a bond/swap; under current conditions, this same issuer might expect only 25-30 basis points below...Many issuers now find it more cost-effective to approach the floating rate note market than the bond/swap market."[6]

But if the opportunities for classic financial arbitrage have been eroded by competition, the other three factors remain important and can be expected to stimulate further activity in swaps

How Did the Swaps Market Evolve?

A picture of the historical development of the swaps 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 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; but — and this is a crucial point — they involved virtually no direct exposure for the intermediary. 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 US dollar interest rate swaps, there were fewer areas in which counterparties might not match than had been the case for currency swaps. The product had become more homogeneous; and because the product had become more homogeneous, there was less demand for one-off deals. Instead of requiring an exactly matching counterparty, the intermediary could bundle counterparties.

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 was unprofitable for the intermediary. Instead, the intermediaries began to accept swap contracts without a counterparty, taking the risk into their own books and either matching it internally with an offsetting position or hedging it with government securities or instruments in the financial futures market.

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.

Looking at the participants in the swaps market, the dominant intermediaries in the early stage of development were investment banks. As the market

6 Bankers Trust Company, "The International Swap Market," cited earlier

Standardization has been more pronounced for interest rate swaps, which may go a long way in explaining why this market has grown more rapidly than that for currency swaps.

evolved, the entrants into this market were more highly capitalized firms, in particular commercial banks. This evolution fits precisely with that of 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.

As we noted, the path the swaps market followed in its evolution is similar to that other markets have taken — most notably, the development of the options market. Prior to 1973, the market for put and call options in the U.S. was an over-the-counter market. Members of the Put and Call Dealer's Association would write options, but only on a one-off basis. Each option was virtually unique because (1) the maturity date was set 181 days from the date the contract was written and (2) the exercise price was set as a function of the prevailing stock price (usually at the stock price). The result was that, for options, there was little volume, little liquidity, and virtually no secondary market. The growth of the options market occurred after the Chicago Board Options Exchange standardized the contracts (maturity dates and exercise prices) and developed an active secondary market. Dealing with a homogeneous product rather than individual customized deals, market makers were able to manage their risks by managing bid-ask spreads to maintain a neutral exposure rather than hedging each transaction on a one-off basis. While over-the-counter options are still offered, the real liquidity in the options market is in exchange-listed options. The options market evolved by moving from an individualized, custom-made product to one resembling a commodity.

While swaps have not evolved to the point of becoming exchange-traded instruments (a point to which we will return in our final section), the paths of evolution — particularly the major factors —have been similar. As was the case with options, contract standardization has played a major role. 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."[7] As we have pointed out, the standardization has been more pronounced for interest rate swaps, which may go a long way in explaining why this market has grown more rapidly than that for currency swaps.

Also paralleling the development of options markets, the growth of the swap market corresponded to the liquidity available through the secondary market. While positions can be traded, the secondary market in swaps normally involves the reversing(unwinding) of a position. The simplest method to unwind a swap would involve a cancellation of the agreement, with a final difference check determined on the basis of the remaining value of the contract. However, since this simple "unwind" could result in taxable income, the more common method of unwinding a swap is by writing a "mirror" swap to cancel out the original. Most market observers indicate that this market is sufficiently deep to decrease risks in the primary market, particularly for short-term swaps. Indeed, a 24-hour market now exists for dollar interest rate swaps of up to 12-year maturities and amounts to $500 million.

Pricing Swaps

The pricing of a swap transaction is the aspect of the swap market that has received the most attention, especially that part of pricing which concerns credit risk. The pricing of a swap involves more, however, than just that single dimension. In fact swap pricing can be viewed as having three major components: forward prices, transaction costs, and the credit risk inherent in the transaction.

Forward Prices. Central to any swap agreement is the forward price — whether it be the forward interest rate, the forward exchange rate, or the forward price of a commodity — embodied in the exchange. Earlier we demonstrated that a swap contract is fundamentally a series of forward contracts.[8] In this view, the forward rate embodied in a swap contract must be the same as the forward rates employed in other corresponding financial contracts such as bonds and futures. And the empirical evidence bears this out: the difference between the two-year swap rate and the forward rate implied by Eurodollar futures declined from over 50 basis points in

7 K. Henderson Schuyler, "The Constraints on Trading Swaps," *Euromoney*, May 1985, pp.63-64

8. Floor-ceiling swaps also involve options.

Because a swap is a package of forward contracts, the forward rates reflected in the swap must conform to the market's view of the future as reflected in the prevailing term structure.

1982 and 1983 to less than 20 basis points in 1984; the remaining 20 basis points essentially reflect the difference in transaction costs and credit risk. This development also confirms our expectation that once the initial financial arbitrage opportunities discussed earlier are exhausted, the forward rates for swaps must conform to the market's view of the future as reflected in the prevailing term structure.

The forward rate component of the pricing of a swap, then, is determined neither by the intermediary nor by the swap market. It is determined by competition from other credit market instruments. Because a swap is a package of forward contracts, the forward rates reflected in the swap must conform to the market's view of the forward rate, or financial arbitrage will be profitable.

Transaction Costs. This component would be reflected in the bid/ask spread for a risk-free transaction plus any origination fees that are charged.[9] The primary determinant of the bid/ask spread is the demand for liquidity. Put another way, the bid/ask spread is determined not by the market maker but, like the forward rate component, by competition in the market. The bid-ask spread, in short, is a market-determined price which reflects the costs of market-making activities.[10]

Credit Risk. In contrast to the preceding components, both of which are independent of the counterparties, the credit risk premium is determined by the specific credit risk of the intermediary and/or the counterparties. The premium added to the bid/ask spread to reflect nonperformance risk depends on characteristics of the counterparty and of the intermediary arranging the swap; it must therefore reflect an appropriate compensation for the probability of default.

It has been argued by some observers that credit risk in a swap contract is priced "too low" relative to the pricing of credit risk in the loan market. To attempt to evaluate such a statement, we examine the determinants of the credit risk premium.

In a loan, the lender has at risk not only the obligated interest payments, but also the loan principal. In a swap the intermediary has at risk only the net cash flow difference at each settlement date. The difference in exposure implies that, for equal levels of nonperformance risk, the credit-risk premium associated with a swap would be far smaller than for a loan of comparable size.

As with a loan, the exposure of the intermediary issuing the swap contract to this firm — or, more precisely, its portfolio exposure to similar firms — is a determinant of the credit-risk premium. However, one element is significantly more important in the case of a swap contract. If the counterparty is arranging the swap as a hedge and if the counterparty has outstanding lines of credit with the intermediary, the swap decreases expected nonperformance losses of the loan. A counterparty which uses a swap to hedge its financial exposure is reducing its overall probability of financial distress.[11] The probability of default for a swap, and therefore the risk premium, depend critically on whether or not the swap has been arranged as a hedge.

Consider the situation in which the swap is a hedge. During periods when the firm would be in financial distress, the swap contract would be in the firm's favor; the firm would be receiving difference checks. For example, consider a firm that experiences some financial difficulty if short-term interest rates rise. Suppose that this firm has entered into an interest rate swap to hedge its interest rate exposure. When short-term interest rates rise, the firm does indeed experience a decline in operating cash flow from its core business; but, at the same time, the firm is receiving inflows from the swap contract. In such a situation, even a firm in financial distress would have no incentive to default on the swap contract.

Therefore, if the swap is a hedge, the probability of default on the swap contract, as well as the probability of default on other liabilities such as loan contracts, are both reduced by this active financial risk exposure management; and the credit risk premiums attached to swap contracts should reflect this difference.

By contrast, if the swap had been used *not* to create a hedge, but rather to speculate on

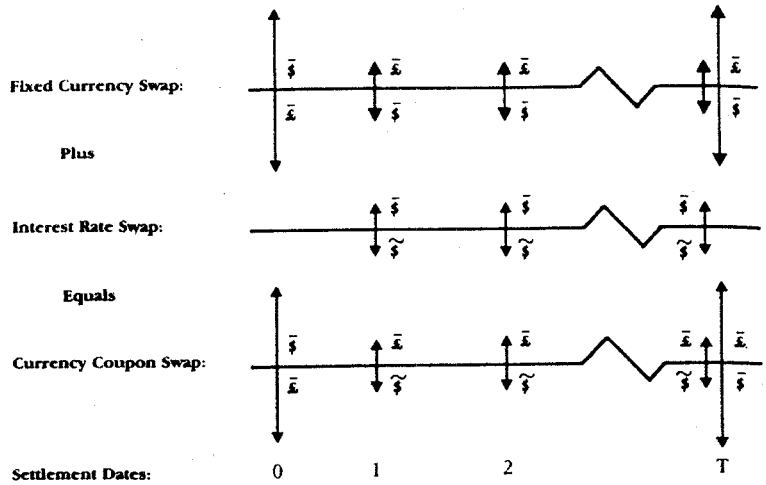
9. In this paper, we do not differentiate between transaction costs reflected in the bid/ask spread and those reflected in up-front origination fees. In essence, we assume that the firm is indifferent about the manner in which it receives its fee for transaction costs.

10. See Harold Demsetz, "The Cost of Transacting," *Quarterly Journal of Economics*, 1968, pp.33-53; and Jack Treynor, "The Only Game in Town," *Financial Analysts Journal*, March-April 1971, pp.12-22

11. Another way of looking at this is that a hedge can make the cost of credit endogenous. It may be advantageous to negotiate swaps and lines of credit simultaneously, since a swap used as a hedge could reduce the cost of the credit line.

If the US decided to place burdensome regulations on swaps, the principal effect on swap activity would be to change the location of swap transactions.

FIGURE 8
A Currency Coupon Swap from Fixed-Rate Pounds to Floating-Rate Dollars Viewed as a Combination of a Fixed Currency Swap from Pounds to Dollars Plus an Interest Rate Swap from Fixed-Rate Dollars to Floating-Rate Dollars



movements in financial markets, the probability of default on the swap is higher and the risk premium should be correspondingly greater. In the same way, if the swap is acting as a reverse hedge, the swap would increase the intermediary's exposure.

The above argument suggests that the credit risk assigned to a swap contract should not be based solely on a credit review of the counterparty. The credit risk associated with a swap contract depends on the exposure of the intermediary to firms similar to the one seeking a swap contract and on whether or not the swap acts as a hedge.

We have purposely not dealt with more technical aspects of credit risk, such as the degree to which risks change if a swap is unwound, the credit risk implications of trading swap positions, and the legal standing of swap contracts in a bankruptcy. (Some of these will be considered in the next section.) Instead, our objective has been to point out what we think are the special features in evaluating the credit risk of a swap: (1) there is no principal at risk so we have "settlement risk" rather than "credit risk" per se; and (2) whether the swap is used as a hedge is an important factor. On the basis of what we have seen, we tend to be more optimistic than many observers about the probability of defaults. One piece of evidence consistent with our view is the fact that in June of 1985, Citicorp determined that it had been overcautious, and thus reduced its assessment of credit risk, in its pricing of swaps.

Pricing Restrictions from Arbitrage. Our major emphasis has been on viewing swaps as packages of forward contracts. We believe that the approach of pricing swaps by breaking them down into a set of fundamental cash flows is by far the most general, and thus the least restrictive, framework for evaluating new products; it is also likely to be the most flexible in solving pricing problems for very tailored swaps. At the same time, however, we have suggested that complicated swaps can also be decomposed into more simple swaps. For example, as Figure 8 demonstrates, a currency coupon swap is equivalent to a fixed currency swap plus a simple interest rate swap. The idea of unbundling swaps into other swaps can be important in identifying arbitrage opportunities within the market. For example, the cost of a currency coupon swap should be compared to the cost of a simple interest rate swap plus a fixed currency swap. Because they are equivalent transactions, the sum of the prices of the least costly alternative for each component is the best guide to pricing the complex swap.

Moreover, from the perspective of the intermediary, swap decomposition is important for exposure management by the intermediary. Again considering a currency swap, it may be easier to find

If swaps move further toward exchange trading, investment banks will be the major beneficiary. On the other hand, if the intermediary continues to bear risk (or if the liability for the intermediary is increased), commercial banks will be the beneficiary.

counterparties for a currency coupon swap by looking for separate counterparties for the interest rate and the currency swap components.

The Future of the Swap Market

We do not purport to be able to predict the future for this market. Indeed, we subscribe to the adage that "he who lives by the crystal ball ends up eating ground glass." Certain factors, however, are likely to have the largest impact on the future evolution of this market. In this section, we will point out those factors we think are most important and suggest possible outcomes.

Liability of the Intermediary. Much of what we have read in the trade journals and heard from the market participants involves conjecture about the swap market "after the first major default." This reflects uncertainty about the legal standing of swap contracts and, more significant, a good deal of controversy over the liability borne by the intermediary (both the current level and the appropriate level).

At one extreme, there are those who argue that the intermediary should assume no liability. Proponents of this view recommend making swaps more like exchange-traded instruments. Suggestions include marking swaps to market with callable margins (or with variable fees) and collateralization (with or without a clearing house).

At the other extreme are those who argue that the intermediary should always retain part of the risk. Arguing against the move toward exchange trading, proponents of this position note that, because swaps are like bundles of forward contracts, credit risk of the counterparties is an important element; and the intermediary (who has a comparative advantage in assessing the credit risk) is effectively a counterparty to each side of the contract.

Secondary Market. As we noted, the growth of the secondary market has made possible much of the growth of the swaps market, and future growth depends on the existence of an active secondary market. Whether a still broader secondary market should be encouraged inevitably throws us back on the earlier question of the liability of the intermediary. Proponents of making swaps exchange-traded instruments point out that marking to market or collateralizing permit contract standardization as well as providing effective guarantees against contractual default. Furthermore, if contracts are effectively bonded, as would be the case with marking to market or collateralizing, the secondary markets can be more anonymous.

Opponents of the move toward exchange trading for swaps point out that secondary markets can be active even if the assets are not homogeneous. For example, there exists an active secondary market for mortgaged-backed securities. In this market, performance is guaranteed by mortgage insurance and the reputation of the originating institution. And it is argued that similar mechanisms are also possible in the swaps market.

Regulation. As might be expected, the divisions evident in the preceding issues are also evident when it comes to questions concerning appropriate regulation of this market. One group argues that additional contractual guarantees are necessary if abuses in this market are to be avoided. Hence, in this view, regulation should take the form of codifying the contractual guarantees — for example, requiring that the contracts be marked to market or collateralized. Those taking the opposite position argue that this market is an simply an extension of credit markets and that imposing liability on the financial intermediary is the best way to limit potential abuses.

Besides this controversy over how to regulate, there is also the issue of who should regulate swaps. There are differences in regulatory bodies across countries, and also multiple regulatory bodies within the same country, that need to be considered. (For example, in the United States, the interested regulatory authorities include the Federal Reserve, the SEC, and the Financial Accounting Standards Board.) Under such circumstances, effective regulation will be difficult if not impossible because it requires coordination both within and among countries. If the US, for example, decided to place burdensome regulations on swaps, the principal effect on swap activity would be to change the location of swap transactions. Even if a group of the major countries acted in concert, the economic incentives for swaps discussed earlier suggest that there would be strong motive for some country to supply a favorable legal environment.

The future of the swaps market, then, appears to turn on whether that market moves further in the direction of becoming a widely-traded exchange. While we are not comfortable in predicting the direction the market will actually take, we are confident that the future composition of this market, both the users and the intermediaries, will depend

While the market will continue to develop a more homogeneous set of products with greater liquidity, there will continue to exist a subset of swaps which are custom-tailored.

strongly on the resolution of the above uncertainty. If swaps move further toward exchange trading, investment banks will be the major beneficiary. Removing the liability for the intermediary by marking to market or collateralizing would diminish the emphasis on capital commitment; and if so, investment banks might well regain the dominance they enjoyed in the earliest stages in the evolution of this market. On the other hand, if the intermediary continues to bear risk (or if the liability for the intermediary is increased), commercial banks will be the beneficiary.

The degree to which the swap market moves toward exchange trading will also determine the users of this market. With credit risk borne by the intermediaries, entry to the swaps market may well be denied to lesser credits. Hence, the predominant users of swaps will be the best credit risks. If the swaps market moves toward exchange trading, however, this composition will change. Lesser credit risks will be able to enter the swap market. Furthermore, to the extent that collateralization or some other form of bonding raises the cost of a swap transaction, the best credits will be expected to exit the market, refusing to pay the implicit insurance premium.

Because of the considerable dispute about the appropriateness of moving further toward exchange trading, there is no consensus about the future form of the swaps market. But there are issues where a consensus is possible. Most observers agree, for example, that while the market will continue to develop a more homogeneous set of products with greater liquidity, there will continue to exist a subset of swaps which are custom-tailored. The commercial banks should dominate in the homogeneous swaps market, which will be characterized by high volume, low spreads, and a significant capital commitment. Investment banks should continue to have a comparative advantage in the customized end of the market.