The Growth of the Swap Market

In Chapter 9 we noted that one of the few claims on which there is general agreement is that the swap market has grown dramatically. The conventional wisdom is that the growth of swaps is due to their ability to take advantage of some kind of “arbitrage opportunity.” This view was articulated by Mr. Robin Leigh-Pemberton, governor of the Bank of England, when he argued that swaps permit a borrower to “arbitrage” the credit markets, allowing “a good credit rating in one part of the currency/maturity matrix to be translated into relatively cheap borrowing in another.”

An often-cited example of this “credit arbitrage” is the case of an interest rate swap between an AAA-rated borrower and a borrower with a BBB rating. As illustrated in Table 10-1, a borrower rated AAA would be expected to be able to borrow more cheaply than one rated BBB regardless of whether rates are fixed or floating. However, note in Table 10-2 that the credit spread between the AAA and the BBB is higher for fixed than for floating rates.

The assertion is that the swap “arbitrages the credit spread differential” of 120 – 50 = 70 basis points. As illustrated in Table 10-3, suppose the AAA firm borrows fixed and the BBB firm borrows floating. Then, if the two firms enter into an interest rate swap, both firms can end up with lower borrowing costs. Indeed, in this case, where there is no financial intermediation, the firms end up splitting the credit spread differential.

2. The specific example we use is adapted from “The International Swap Market,” an advertising supplement by Bankers Trust Company to Corporate Finance (September 1985). However, the arguments contained in this example are used widely in the swap market.
Table 10-1. Illustrative Borrowing Costs for AAA and BBB Borrowers.

<table>
<thead>
<tr>
<th>AAA</th>
<th>BBB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borrow fixed</td>
<td>10.8%</td>
</tr>
<tr>
<td>Borrow floating</td>
<td>LIBOR + 1%</td>
</tr>
</tbody>
</table>

Source: Bankers Trust.

The preceding illustration is consistent with the available data:

1. Quality differentials exist between fixed and floating borrowing, referred to as "quality spreads," and these quality spreads are generally observed to increase with maturity.  
2. The fixed-rate payor in a swap is predominantly the less credit-worthy party.
3. Firms have been able to lower their nominal funding costs by using swaps in conjunction with these quality spreads.

However, it is less clear that this kind of behavior has anything to do with classic financial arbitrage. First, financial arbitrage should lead to decreasing, not increasing, swap volatilities. As the quality spread is arbitrated, the rate differences would be eliminated, and this rationale for interest rate swaps should disappear. Second, this simplistic "credit arbitrage" story ignores the underlying reason for the quality spread.


Table 10-2. Illustrative Credit Spreads.

<table>
<thead>
<tr>
<th>BBB - AAA Borrowing Rates</th>
<th>Credit Spread</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>= 120 basis points</td>
</tr>
<tr>
<td>Floating</td>
<td>= 50 basis points</td>
</tr>
</tbody>
</table>

Source: Bankers Trust.
Table 10-3. The “Savings” from a Swap.

<table>
<thead>
<tr>
<th></th>
<th>AAA</th>
<th>BBB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAA borrows fixed</td>
<td>(10.8%)</td>
<td>(LIBOR + 1/2 %)</td>
</tr>
<tr>
<td>BBB borrows floating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swap:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AAA receives fixed,</td>
<td>10.9%</td>
<td>LIBOR</td>
</tr>
<tr>
<td>pays floating</td>
<td>(LIBOR)</td>
<td></td>
</tr>
<tr>
<td>BBB receives floating,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pays fixed</td>
<td></td>
<td>(10.9%)</td>
</tr>
<tr>
<td>Overall cost of funding</td>
<td>LIBOR−1/10 %</td>
<td>11.65%</td>
</tr>
<tr>
<td>Savings</td>
<td>0.35%</td>
<td>0.35%</td>
</tr>
</tbody>
</table>

Source: Bankers Trust.

Comparative Advantage

We have heard many market participants assert—and these assertions have been picked up by the trade publications—that the quality spreads result from firms having a “comparative advantage” in one of the credit markets. According to this view, the AAA-rated company borrows in the fixed-rate market, where it has a comparative advantage. The BBB-rated company borrows in the floating-rate market, where it has a comparative advantage. Then the firms use an interest rate swap to exploit their comparative advantages and produce interest rate savings.

While this argument is appealing, it neglects arbitrage. With no barriers to capital flows, the comparative-advantage argument from elementary trade theory cannot hold. Arbitrage eliminates any comparative advantage.

Aside

Comparative Advantage

The concept of comparative advantage is used in international trade theory to explain why countries trade. As you should remember from your economics course, this concept was based on factor immobility:

The United States has a comparative advantage in wheat because the United States has wheat-producing acreage not available in Japan. If
land could be moved—if land in Kansas could be relocated outside Tokyo—the comparative advantage would disappear.

For the concept of comparative advantage to make sense as a rationale for swaps, immobility would have to exist in the financial markets. And this assumption of immobility does not square with observations of the financial markets. The integrated capital markets will provide the BBB access to fixed-rate markets, either directly or indirectly by AAA-rated firms borrowing fixed and relending it to BBB-rated firms.

Given the weakness in the theory of comparative advantage, a number of alternative explanations have been proposed.

Underpriced Credit Risk or Risk Shifting
Some have suggested that the quality spread results because the market for fixed-rate funding prices risk differently than does the market for floating-rate funding. Specifically, it has been argued that credit risk is underpriced in floating-rate loans.4 Underpriced credit risk for floating-rate loans would certainly explain the growth of the interest rate swap market: the gain from the swap would be at the expense of the party underpricing credit risk in the floating-rate debt market. However, the expansion of the swap market effectively increases the demand for floating-rate debt by lower-rated companies and the demand for fixed-rate debt by higher-rated companies, thereby eliminating the supposed differential pricing. So, like the comparative advantage argument, this rationale would be self-eliminating and therefore could not explain the continuing growth of the swap market.

Along a similar line, Jan Loey suggests that the quality spread is the result of risk being shifted from the lenders to the shareholders.5 To the extent that lenders have the right to refuse to roll over debt, more default risk is shifted from the lender to the shareholders as the maturity of the debt decreases. With this explanation, the "gains" from a swap would instead be transfers from the shareholders of the lower-rated firm to the shareholders of the higher-rated firm.

4. For example, in "The Valuation of Floating Rate Instruments: Theory and Evidence," Journal of Financial Economics 17, no. 2 (December 1986): 251-272, Krishna Ramaswamy and Sundar M. Sundaresan looked at the market for floating-rate loans and argued that the (default) premiums are lower than would be predicted.
Information Asymmetries

Why does a firm choose to issue short-term floating-rate debt and then swap this floating-rate payment into a fixed-rate payment, rather than using one of the alternatives: keep the short-term debt unswapped, issue long-term fixed-rate debt, or issue long-term floating-rate debt? Marcelle Arak, Arturo Estrella, Laurie Goodman, and Andrew Silver (all of Citicorp) argue that the “issue short-term-swap to fixed” combination would be preferred if the firm

- has information that would lead it to expect its own credit spread to be lower in the future than the market expectation
- is less risk-averse to changes in its credit spread than is the market
- expects higher risk-free interest rates than does the market
- is more risk-averse to changes in the risk-free rate than is the market

For example, suppose the firm desired fixed-rate funding for a project, but the company had inside information indicating that its credit rating would improve in the future. By issuing short-term debt, the firm would be able to exploit its information asymmetry; and, by swapping the debt into fixed-rate, the firm is able to eliminate its exposure to interest rate risk.

As Arak and her colleagues point out, firms that are pessimistic about future risk-free rates but optimistic about their own credit standing are drawn to the swaps market—that is, issue short-term, and swap to fixed. The expected savings would be divided between this firm and the counterparty based on prevailing demand and supply conditions.

Differential Prepayment Options

The savings in nominal-stated—borrowing cost obtained via a swap can also be understood by considering options available to the borrower. Most fixed-rate debt includes a prepayment option. If interest rates decline, the borrower can put the loan back to the lender and obtain lower-cost financing by paying the prepayment fee and the origination.

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fees on the new financing. Indeed, in standard corporate bond issues, this is simply the call provision.

In contrast, interest rate swaps contain no such prepayment option. According to the standards proposed by the International Swap Dealers Association (1986), early termination of a swap agreement requires that the remaining contract be marked to market and paid in full.

Hence, the positions of the firm that has borrowed fixed directly and the firm that has borrowed floating and swapped to fixed are quite different. The former owns a put option on interest rates; the latter does not.

Example
The value of the right to prepay
Consider the BBB-rated firm described earlier. It can obtain fixed-rate funding in two ways:

1. Borrow fixed directly at 12%.
2. Borrow floating and swap to fixed at 11.65%.

If capital markets are efficient—and the available evidence says they are—the fact that method 1 costs more than method 2 implies that it offers something method 2 does not. Included in that "something" may be the right to repay the loan early. When would the firm want to exercise this right? Clearly, the firm would want to exercise the right if rates fall.

If rates fall, the firm could pay off this loan and refinance at the lower rate. And, as illustrated, the further rates fall, the more valuable is this right.

This illustration of the value of the right to repay early is the payoff profile for owning an interest rate option—specifically, a put option on interest rates. Hence, it is not surprising that method 1 costs more than method 2, since it contains an option not contained in method 2.
In this context, the transaction between the AAA-rated firm and the firm rated BBB looks less like financial arbitrage and more like an option transaction. The BBB-rated firm can borrow at a fixed rate more cheaply by swapping from floating because the "borrow floating-swap to fixed" alternative does not include the interest rate option contained in the "borrow fixed" alternative. The BBB firm, in effect, has sold an interest rate option. At least a portion of the funding cost "savings" obtained by the BBB firm, as well as the cost savings gained by the AAA firm, come from the premium on this option.

Tax and Regulatory Arbitrage

In contrast to the classic arbitrage considered previously (where the firm would earn a riskless profit by exploiting pricing differences for the same instrument), tax and regulatory arbitrage is a situation in which the firm can earn a risk-free profit by exploiting differences in tax and/or regulatory environments.

A firm issuing dollar-denominated, fixed-rate bonds in the U.S. capital markets has to comply with the requirements of the U.S. Securities and Exchange Commission. In the less-regulated Eurobond market, the costs of issue could be considerably less—as much as 8% basis points less. However, not all firms have direct access to the Eurobond market. The swap contract provides firms with access and permits more firms to take advantage of this regulatory arbitrage.

Moreover, firms issuing in the U.S. capital markets, as well as the security purchasers, have generally been faced with the provisions of the U.S. tax code. The introduction of the swap market allows an "unbundling," in effect, of currency and interest rate exposure from the tax rates in some very creative ways.

For example, with the introduction of swaps, a U.S. firm can issue a yen-denominated debt in the Eurobond market, structure the issue so as to receive favorable tax treatment under the Japanese tax code, avoid much of the U.S. securities regulation, and yet still manage its currency exposure by swapping the transaction back into dollars. Unlike the classic financial arbitrage we have described, there is no reason for opportunities for tax or regulatory arbitrage to disappear (barring changes, of course, in the various tax and regulatory codes).

1. Jan G. Loes. op. cit.
23r Swaps

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

Example

Arbitraging Japan's tax and regulatory authorities

In 1984, Business Week reported that U.S. firms had discovered a way to make "free money." As it turns out, this "free money" was being given away by the Japanese tax authorities. In 1984, zero-coupon bonds received particularly favorable tax treatment in Japan. The income earned from holding the zero-coupon bond (the difference between the face value of the bond and the price at which the bond was purchased) was treated as a capital gain; and, since capital gains were untaxed, the effect was to make the interest income or the zero coupon not taxable for the Japanese investor. The result was that a zero-coupon bond sold to Japanese investors would carry a below-market interest rate.

In contrast, the U.S. tax authorities regarded the zero-coupon bond like any other debt instrument. Any U.S. firm issuing such a bond was permitted to deduct the imputed interest payments from income, thereby maintaining its tax shield.

Since, there existed a tax arbitrage opportunity: the two tax authorities treated the same instrument differently. Not surprisingly, a number of U.S. firms—Exxon and General Mills among them—issued zero-coupon yen bonds, illustrated below.

The U.S. firm issuing the zero coupon bond was no doubt pleased with the savings it achieved in interest expense. However, most U.S. issuers were much less pleased with the yen exposure that came with this zero-coupon yen bond. Hence, the assignment to the merchant investment bank was relatively straightforward: Eliminate the yen exposure while keeping as much of the savings in interest expense as possible.

As should be clear, the exposure profile for this U.S. issuer of a zero-coupon yen bond is as illustrated below. Such an exposure could be managed via a forward yen-dollar contract, but the maturity of these bonds—five to ten years—

eliminated forward contracts as a possibility, since the bid-offer spread on a ten-year forward contract was unacceptably high.

Futures contracts were also eliminated as a means of managing this exposure, since five- and ten-year futures contracts were not available. (Five- and ten-year strips of $f_i$ futures are still not available. The longest available futures contract on foreign exchange is about twelve months.)

Hence, the best available financial instrument for neutralizing this yen exposure was (and still is) a swap. To minimize the cost of the swap (the bid-offer spread), we would want to use a standard, at-market-rate currency swap. However, when we combine such a currency swap with our zero-coupon bond, we get in the following diagram that the job is not done: there are still some yen cash flows.

The remaining yen cash flows could be eliminated by adding a simple loan with a sinking fund. As the following figure illustrates, the amortizing yen loan would eliminate the remaining yen cash flows, and the U.S. issuer would end up with a set of cash flows identical to none for a dollar bond with below-market coupons.
Swaps

Remaining cash flows from Zero coupon + swap

PLUS

Loan with sinking fund

EQUALS

Dollar bond with below-market coupons

However, there was a way to structure the package that would result in a spill-over realized interest rate for the U.S. issuer. In addition to the tax arbitrage, a regulatory arbitrage was available: the Ministry of Finance limited the amount a pension fund could invest in non-yen-dominated bonds issued by foreign corporations to at most 10% of their portfolio. However, the Ministry of Finance ruled that 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 U.S. firm was able to capitalize on the desire of Japanese pension fund managers to diversify their portfolios internationally, while at the same time adhering to the regulation imposed by the Ministry of Finance.

Hence, the remaining yen cash flows from the zero-coupon yen bond would be absorbed not by the amortizing loan but rather by the combination of a dual-currency bond and a spot currency transaction, as illustrated below. Moreover, this figure illustrates that the resulting cash flows are like those for a deep-discount dollar bond with below-market coupons.
The U.S. firm will:

1.Issue a 10-year U.S. dollar bond in the amount of X yen.

2. Enter into a cross-currency swap with a principal of Y yen for 2 years.

3. Enter into a yen currency swap with a principal of Z yen for 2 years.

4. Use a spot currency transaction to convert X yen to euros.

To settle up with a net of cash flows that are the same, the firm will issue a dollar bond with a similar coupon rate.
The entire process can be summarized as follows: The U.S. firm will (1) issue a zero-coupon yen bond in the amount of Y yen, (2) issue a dual-currency bond in the amount of X yen, (3) enter into a currency swap with a principal of X yen, and (4) use a spot currency transaction to convert Y yen to dollars. The result of these transactions is a set of cash flows that are like a deep-discount dollar bond with below-market coupons as shown at the top of page 223. The CFO of this firm is happy to end up with below-market funding. The merchant/investment banker is happy to end up with a nice fee. And The Wall Street Journal and The Financial Times are both happy because they got the advertising revenue for running the three tombstones depicted at the bottom of page 223.

The arbitrage opportunity described in the preceding example disappeared when the Japanese tax authorities changed their ruling on yen zeros. However, other tax and regulatory opportunities have existed, and some continue to exist. For example, in many European countries, the purchasers of zero-coupon bonds do not escape taxes (as was the case in our example); however, the tax is deferred until the maturity of the bond, and the tax rate paid is the lower, capital gains rate. Also, there are sometimes regulatory barriers limiting entry of potential issuers and thereby reducing the cost of borrowing in that market. For example, by gaining access to the restricted Swedish bond market and then swapping the proceeds, the World Bank was able to effectively borrow at a below-market rate.9

Exposure Management

Since swaps can be used to manage a corporation’s exposure to interest rate, foreign exchange, and commodity price risk, part of the growth in interest rate swaps simply reflects general corporate hedging activities. Corresponding to the growth in the swaps market, the available market data suggest that the use of the other off-balance-sheet hedging instruments is also increasing:10

- Treasury bond futures contract (CBOT) volume grew from 32,000 contracts in 1977 to 67 million contracts in 1987.

- Eurodollor futures contract (CME) volume grew from 15,000 contracts when the contract began in 1981 to 20 million contracts in 1987.
- Deutsche mark futures contract (CME) volume grew from 134,000 contracts in 1977 to 6 million contracts in 1987.
- Crude oil futures contract (NYMEx) volume grew from 323,000 contracts in 1983 to 15 million contracts in 1987.
- The number of options contracts traded grew from 2.6 million in 1983 to approximately 46.2 million in 1987.

Hence, another way of asking why swaps have grown so dramatically is to ask why more and more firms have decided to manage their exposures to financial prices—i.e., to exchange rates, interest rates and commodity prices.

One reason firms have been hedging more is obvious. As pointed out in Chapter 1, firms are more likely to manage risks in the 1980s because the world is riskier today than it was in the 1960s and early 1970s. The 1970s ushered in increases in volatility for exchange rates, interest rates, and commodity prices.

However, the mere fact that the financial environment is more risky is not in and of itself sufficient for the firm to decide to manage this risk. Although a complete discussion of the rationale for hedging will be deferred until Chapter 17, let us note here that in addition to the risk aversion rationale for the owner of a closely held corporation, there are several reasons for widely held corporations to undertake hedging programs. Value-maximizing firms may elect to hedge using swaps or some other financial instrument if this hedging

- reduces the expected tax to be paid by the firm,
- reduces the expected cost of financial distress, or
- reduces agency costs, that is, the costs of conflict between shareholders and bondholders or between shareholders and managers.

We will return to the effect of risk management on expected future tax liabilities and on the expected cost of financial distress in Chapter 17. However, at this point it is useful to note that Larry Wall looked specifically at the agency costs issue in the context of swap contracts.11

He noted that long-term, fixed-rate debt can increase agency costs between shareholders and bondholders: If the firm issues long-term debt, shareholders have the incentive to underinvest (i.e., pass up positive-net-present-value projects) or to shift from low-risk to high-risk projects. Recognizing this incentive, bondholders demand a large premium on long-term debt. However, this "opportunistic behavior premium" is lower for higher-rated firms, presumably because they have an established reputation. Clearly, this opportunistic behavior—and the corresponding premium—can be avoided by issuing short-term debt, but short-term debt exposes the firm to interest-rate risk. Well notes that by issuing short-term and swapping to fixed, the lower-rated firm is able to control the agency problem, while at the same time avoiding interest rate risk.

To put this theoretical argument into perspective, let's look at an example.

Example

Hedging and investment incentives

To illustrate how hedging can control the under-investment problem in a firm with uncertain cash flows, consider a firm subject to oil price risk: if oil prices rise, the value of the firm in period 1 will be higher than it will be if oil prices fall. For simplicity, let's suppose only two outcomes with a 50-50 probability:

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Probability</th>
<th>Value of Firm in Period 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of oil rises</td>
<td>.5</td>
<td>1,000</td>
</tr>
<tr>
<td>Price of oil falls</td>
<td>.5</td>
<td>200</td>
</tr>
</tbody>
</table>

The firm has a riskless investment opportunity: an outlay of $600 in period 1 will result in an income of $800 in period 2 with certainty.

The firm plans to issue in period 1 bonds with a face value of $500 and pass on the proceeds to the shareholders. Again, for simplicity, assume: (1) no transaction costs, (2) no taxes, and (3) a risk-free interest rate equal to zero.

As shown in Table 10-4, if the price of oil falls, the firm will pass up a positive NPV project; that is, if the value of the firm in period 1 is $200, the shareholders will not undertake the investment project. Note that although the

Table 10.4. Uncertainty and the Investment Decision.

<table>
<thead>
<tr>
<th>Value of Firm</th>
<th>Value of Debt</th>
<th>Value of Equity</th>
<th>Undertake project</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000</td>
<td>1,200</td>
<td>500</td>
<td>700</td>
</tr>
<tr>
<td>Undertake</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not</td>
<td>1,000</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>undertake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>400</td>
<td>500</td>
<td>100</td>
</tr>
<tr>
<td>Undertake</td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not</td>
<td>200</td>
<td>200</td>
<td>0</td>
</tr>
<tr>
<td>undertake</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Face value of the debt is $500, the market value of the debt is equal to the expected value of the debt:

$$\frac{1}{2}(500) + \frac{1}{2}(200) = 350$$

The expected value of the shareholder’s equity in the firm is $$\frac{1}{2}(700) + \frac{1}{2}(0) = 350$$. Hence, the net value of the shareholder’s holdings—the value of their equity in the firm plus the money they received from the debt issue—is $350 + $350 = $700.

However, suppose the firm could enter into a simplified commodity swap agreement:

Price of oil rises: firm pays $400
Price of oil falls: firm receives $400

Now the value of the firm is hedged against oil prices; regardless of what happens to oil prices, the value of the firm is $600. Would the shareholders want to enter into this swap?

As Table 10-5 indicates, with the value of the firm hedged against oil prices, the positive NPV project will always be undertaken. And, with the hedge against oil price, the net value of the shareholder’s wealth is $800 (the proceeds of the debt issue plus $300 the value of their equity). That is, by hedging, the value of the shareholder’s wealth has increased by $100.
Table 18-5. Hedging and the Investment Decision.

<table>
<thead>
<tr>
<th>Value of Firm</th>
<th>Period 1</th>
<th>Period 2</th>
<th>Undertake positive NPV project?</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>800</td>
<td>506</td>
<td>300</td>
</tr>
<tr>
<td>Undertake project</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not undertake</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Synthetic Instruments

Still another reason for the growth of the swap market is the usefulness of swaps in the synthetic creation of new financial instruments. For example, consider long-dated interest rate forward contracts, historically a very illiquid market. Since interest rate swaps can be viewed as portfolios of forward interest rate contracts, long-term swaps have been stripped to synthesize long-dated forwards and thereby increase liquidity in the market for long-dated forward rate agreements.

Less obvious is the manner in which currency and interest rate 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.

Furthermore, swaps can be combined with existing products to create new financial instruments. As will be described in Chapter 18, the combination of a conventional fixed-rate loan and an interest rate swap, where the party pays fixed, results in a "reverse floating-rate loan."

Liquidity

A final factor explaining the observed growth in the swap market is the substantial reduction in bid-ask spreads. In 1982, these spreads exceeded 200 basis points; by 1987 they were frequently less than 10. Thus, the dramatic increase in volume has been accompanied by an equally dramatic increase in the liquidity of the swaps market.