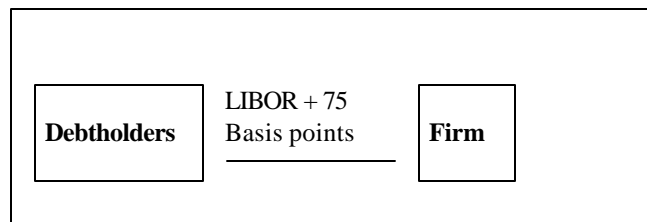
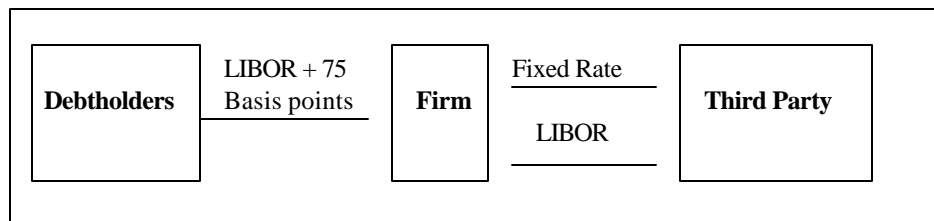


## VALUATION OF “PLAIN VANILLA” INTEREST RATES SWAPS

Interest-rate swaps have grown tremendously over the last 10 years. With this development, there has been a corresponding need to understand their pricing. An interest-rate swap in its simplest form is the exchange of a fixed-rate interest payment for a floating-rate interest payment. For example, a typical swap transaction might begin with a firm that has issued a three-year floating-rate debt instrument, where the floating rate is  $\text{LIBOR}^1 + 75$  basis points (one basis point equals 0.01%).



However, because LIBOR changes for each interest payment and the firm does not want the interest rate uncertainty, management decides to swap the floating-rate obligation into a fixed-rate loan. A swap stipulates that the firm pay a fixed rate to a third party in return for the firm receiving payments based on LIBOR for the three-year term of the debt. The LIBOR payments received by the firm are used to cover the LIBOR payments to the debt holders, and the




---

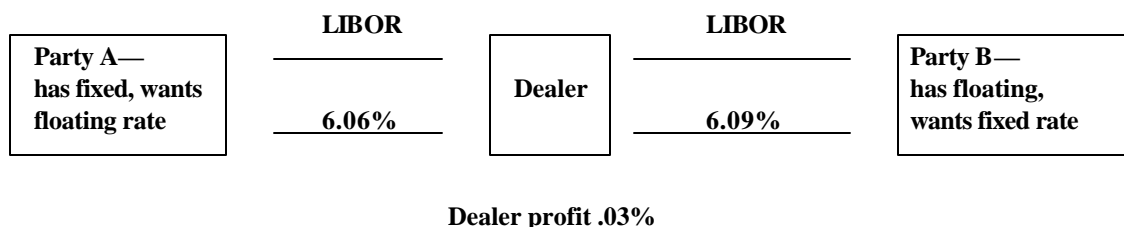
<sup>1</sup>LIBOR is the London Interbank Offer Rate, the rate that large international banks charge each other for loans, and hence it has become the base rate for short-term loans made by banks to large corporations.

net cost of the debt to the firm ends up equaling the fixed rate to the swap partner (the third party) plus 75 basis points. The objective of this note is to show how an interest-rate swap should be valued, i.e., how the fixed-rate portion of the deal should be determined.

### The Problem

The problem of pricing a standard interest-rate swap can be addressed at a number of different levels, depending on the level of accuracy required. Accuracy in this case means how accurately you account for potential differences in the timing of the cash flows to each party. In a real transaction involving \$500 million or more, the interest cost or payment received for just one day makes a difference. This note avoids this issue by assuming that it is always exactly three months between each payment.

Let's consider the specifics of the most common form of a swap, called a "plain vanilla" swap. This involves the swapping of a floating-rate (LIBOR) payment for a fixed-rate payment, which is quoted as a spread over the U.S. Treasury rate of the same maturity. Examples of swaps and their pricing structure are shown in **Exhibit 1**. The swap rate quotes in Exhibit 1 are for the case where the floating-rate is based on the prevailing 6-month LIBOR rate where the floating and fixed payments are made semi-annually.<sup>2</sup> Exhibit 1 reveals that if you want to receive the fixed rate in a two-year swap, you will receive 6.06 percent and pay six-month LIBOR. If you want to pay the fixed rate, you will pay a fixed rate of 6.09 percent and receive six-month LIBOR. The difference between the ask and the bid is the amount that the dealer makes as a profit or spread on the swap by receiving 6.09 percent and paying out 6.06% on the fixed-rate part of the deal.



---

<sup>2</sup>The convention for a plain vanilla swap is that LIBOR payments are based on the rate in effect at the beginning of the period. This means that the interest due on the payment date equals the 3-month LIBOR in effect at the beginning of the quarter times the notional principal.

All of the dates for payment are specified in the contract. At the inception of the swap no principal is exchanged, and the payments, both floating and fixed, are based on an amount called the notional principal. Assume a notional amount of \$100 million for convenience and a signing date of June 17, 1995. The terms of a two-year swap would be that one party pays the three-month LIBOR that prevails at the beginning of each quarter and in return receives 6.06 percent of \$100 million paid quarterly (\$ 1.515 million). The fixed payment is made every three months and the floating payment is reset every three months to the new LIBOR rate in effect at that time. The payment schedule looks as follows:

| Type of Payment | 9/17/95       | 12/17/95      | 3/17/96       | 6/17/96       | 9/17/96       | 12/17/96      | 3/17/97       | 6/17/97       |
|-----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Fixed           | \$1.515 mill. | \$1.515 mill. | \$1.515 mill. | \$1.515 mill. | \$1.515 mill. | \$1.515 mill. | \$1.515 mill. | \$1.515 mill. |
| Floating        | 3 mo LIBOR    | 3 mo LIBOR    | 3 mo LIBOR    | 3 mo LIBOR    | 3 mo LIBOR    | 3 mo LIBOR    | 3 mo LIBOR    | 3 mo LIBOR    |

Swaps are often quoted as U.S. Treasury yields + basis points. For example, the quote of 6.06 percent represents a 15 basis-point spread over the prevailing two-year U.S. Treasury rate of 5.91 percent. The pricing of an interest-rate swap involves determining what fixed rate to accept today in exchange for receiving the floating-rate flows.

### Pricing Interest-Rate Swaps

#### Example

Like most other derivative-based financial instruments, interest-rate swaps are priced on the basis of arbitrage. Assume that you own a three-year (\$50 million face value) bond with an interest rate equal to the three-month LIBOR rate.<sup>3</sup> You are aware that LIBOR has been fairly volatile over the last five years (see **Figure 1**) and you would like to eliminate the interest-rate risk that you face for the LIBOR rate over the next three years. Interest payments are due quarterly on the 17th of September, December, March and June of each year and are calculated by taking the three-month LIBOR rate at the beginning of each quarter times the \$50 million of face value. Thus, if today was June 17 and the current three-month LIBOR was 5.75 percent, the first interest payment would be 5.75 percent / 4 = 1.4375 percent of \$50 million for a payment of \$718,875 due on September 17.<sup>4</sup>

---

<sup>3</sup>Note that usually such a bond would have a rate equal to LIBOR plus some number of basis points (for example, LIBOR + 50 basis points).

<sup>4</sup>We will assume that it is exactly one-fourth of a year between interest payments. In reality the actual number of days would be used to calculate the fraction of the year in each quarter.

### Eurodollar Futures

Eurodollar futures contracts can be used to lock in the forward LIBOR interest rates. **Exhibit 2** shows the Eurodollar futures contract specifications, and **Exhibit 3** shows Eurodollar futures prices for June 17, 1995. A futures contract is a contract between two parties: one who agrees to buy (long position) at a set price and a seller (short position) who agrees to sell at that price. In this case the underlying asset is the rate on a Eurodollar 90-day deposit. For example, the September Eurodollar deposit rate is 5.74 percent, which means that a three-month deposit would earn 1.435 percent for the three months beginning September 17. When two parties agree on a futures contract they are agreeing on the forward LIBOR rate which is quoted as a Eurodollar futures price as follows:

$$\text{Eurodollar Futures Price} = 100 - (\text{agreed upon rate} \times 4) * 100$$

Thus, if the both sides agreed on a rate of 1.435 percent for the three months, the Eurodollar Futures price would be 94.26. As another example, Exhibit 3 shows that the contract that matures in September 1996 has a quoted settle price of 94.02 which implies an annualized rate of 5.98 percent  $([100 - \text{Eurodollar Futures Price}]/100)$ . Based on this price, the implied annual forward rate is 5.98 percent or 1.495 percent for the three-month period, September-December.

### Hedging with Eurodollar Futures

In the case of the three-year loan with a \$50 million face value and an interest rate equal to three-month LIBOR, the interest-rate risk of the floating rate could be eliminated by using Eurodollar futures. Since we would want to receive money when interest rates rise and pay when they drop, we should take a short (sell) position in the Eurodollar futures contracts. Suppose we used a short position to hedge the interest-rate risk of the interest payment due December 17, 1996. We would take a short position in 50 Eurodollar futures contracts (\$50,000,000) to hedge our exposure. In doing so, we would fix our interest-rate costs at 5.98 percent. To demonstrate this, assume as above that the actual three-month rate turns out to be 6.25 percent. On our \$50 million loan we would owe \$781,250 in interest, where

$$\text{Interest} = \frac{\$50,000,000 \times [LIBOR]}{4}$$

A short (sell) position in 50 contracts would have resulted in the receipt of a total of \$33,750  $(\$675 \times 50)$  in settlement payments.<sup>5</sup> The hedge therefore reduces the net interest cost to \$747,500  $(\$781,250 - \$33,750)$ .

---

<sup>5</sup>Settlement payment to the futures short position for one contract is determined as:

$$\$1,000,000 (\text{Actual Rate} - \text{Futures Rate})/4$$

Thus, for an actual rate of 6.25% and a futures rate of 5.98% the payment is:

$$\$1,000,000 (.0625 - .0598)/4 = \$1,000,000(.000675) = \$675.$$

– \$33,750). In percentage terms this is 1.495 percent for the quarter (\$747,500/\$50,000,000) or 5.98 percent annualized. If LIBOR turned out to be 5.25 percent, our interest due on the \$50 million would be 1.3125 percent (5.25 percent / 4), or \$656,250. The short position in the 50 Eurodollar futures contracts would require a payout of \$91,250 (\$1,825 × 50) and the total cost would be \$747,500 (\$656,250 + \$ 91,250) or 5.98 percent annualized.

A simple way of viewing the use of Eurodollar futures contracts is the following. Taking the sell side of a Eurodollar futures contract pays off the difference between the forward rate, F and the spot rate, S, or (F-S) x \$1million. Hence the combination of a position of paying the spot rate on \$1 million plus taking the sell side of a Eurodollar futures contract results in a payment of

$$\begin{aligned} \text{Loan + sell-side futures} &= \text{fixed rate} \\ S + (F-S) &= F \end{aligned}$$

The result converts a variable rate payment into a fixed rate payment.

Thus, in this example, the Eurodollar futures contracts can be used to hedge the interest-rate risk and convert a series of unknown future three-month LIBOR rates into a series of known payments. **Exhibit 4** shows the interest rate payments and LIBOR rates that can be locked in today using the Eurodollar futures contracts in Exhibit 3.<sup>6</sup> Because the hedging process allows us to know what all the LIBOR payments will be, we can solve for the fixed-rate payments by setting the present value of the LIBOR payments equal to the present value of the fixed payments.

## Swaps

### Determining spot rates from Eurodollar futures

The usual swap transaction involves swapping from floating into a fixed equal payment. Above we saw that using futures allows us to costlessly convert the uncertain future LIBOR payments into a series of fixed payments. The fixed payments are the certainty equivalent of the LIBOR payments. They are equivalent. It is the same as choosing between four quarters and a dollar bill. You consider them equivalent because you can costlessly change from one to the other. Consequently, the present value of the fixed payments and the floating LIBOR payments should be the same. When we consider swaps, the issue is: what series of fixed equal payments has the same present value as the LIBOR payments?

---

<sup>6</sup>Because futures contracts are “marked to market” daily, they may require periodic cash flows prior to the interest payments being hedged. This makes the hedging process more complicated than presented here and emphasizes the convenience aspect of using swaps to hedge rather than a series of futures contracts.

The first step is to calculate the present value of the LIBOR payments. To do this we need the appropriate discount rates for each payment. This is the LIBOR **spot rate**. Spot rates can be estimated directly from the Eurodollar futures (forward) rates. Assume that the current 3-month LIBOR rate is 5.50 percent and that the futures rates are those shown in **Exhibits 3 and 4**. Then the spot rate for the first payment,  $S_{3 \text{ mos}}$ , is 1.375 percent  $(.055/4)$  for the three months or 5.50 percent annualized. The spot rate for the second payment,  $S_{6 \text{ mos}}$  is 5.62 percent and is computed as follows:

$$\begin{aligned} (1 + S_{6 \text{ mos}}/4)^2 &= (1 + S_{3 \text{ mos}}/4)^1 \times (1 + F_{4-6 \text{ mos}}/4)^1 \\ S_{6 \text{ mos}} &= \{[(1 + S_{3 \text{ mos}}/4)^1 \times (1 + F_{4-6 \text{ mos}}/4)^1]^{1/2} - 1\} \times 4 \\ S_{6 \text{ mos}} &= \{[(1 + .0550/4)^1 \times (1 + .0574/4)^1]^{1/2} - 1\} \times 4 \\ S_{6 \text{ mos}} &= 5.62\%. \end{aligned}$$

Spot rates for each interest-payment period are shown in **Exhibit 5**.<sup>7</sup>

### Pricing Interest-Rate Swaps

Once the spot rates are estimated, the swap can be priced, i.e., the fixed rate that will be exchanged for the LIBOR rate can be computed. The process is to calculate the present value of the fixed hedged payments that result from the Eurodollar futures position using the spot rates as the discount rates (see **Exhibit 6**). The present value of the LIBOR payments from the Eurodollar hedged position is \$8,251,448. In order to find the fixed (annual) swap rate, FC, we need the rate that has the same present value as the present value of the Eurodollar futures hedged, or

$$\$8,251,448 = \frac{FC/4 \times \$50 \text{ mill.}}{(1 + S_{3 \text{ mos}}/4)^1} + \frac{FC/4 \times \$50 \text{ mill.}}{(1 + S_{6 \text{ mos}}/4)^2} + \frac{FC/4 \times \$50 \text{ mill.}}{(1 + S_{9 \text{ mos}}/4)^3} + \dots + \frac{FC/4 \times \$50 \text{ mill.}}{(1 + S_{36 \text{ mos}}/4)^{12}}.$$

Solving for FC/4, we find that a quarterly payment of \$754,934 has a present value of \$8,251,448. On

---

<sup>7</sup>The annualized rates are determined based on the quarter for which the rate is computed. For the three-year swap there are 36 months and 12 quarters. Therefore the final spot rate is  $S_{36 \text{ mos}}$  and is computed as:

$$\begin{aligned} S_{36 \text{ mos}} &= \{[(1 + S_{33 \text{ mos}}/4)^{11} \times (1 + F_{34-36 \text{ mos}}/4)^1]^{1/12} - 1\} \times 4 \\ (1 + S_{36 \text{ mos}}/4)^{12} &= (1 + S_{33 \text{ mos}}/4)^{11} \times (1 + F_{34-36 \text{ mos}}/4)^1 \end{aligned}$$

If we assume that  $S_{33 \text{ mos}}$  has already been computed as 6.012% and the three-month forward rate for months 34-36,  $F_{34-36 \text{ mos}}$ , is taken from Exhibit 3 as the futures rate for March 1998 or 6.56%,  $S_{36 \text{ mos}}$  is:

$$\begin{aligned} S_{36 \text{ mos}} &= \{[(1 + .0612/4)^{11} \times (1 + .0656/4)]^{1/12} - 1\} \times 4 \\ S_{36 \text{ mos}} &= \{[(1.17832) \times (1.0164)]^{1/12} - 1\} \times 4 \\ S_{36 \text{ mos}} &= 6.057\%. \end{aligned}$$

a percentage basis the swap rate (fixed rate) is 1.51% per quarter ( $\$754,934/\$50$  million) or 6.04 percent annualized.

Exhibit 1

VALUATION OF "PLAIN VANILLA" INTEREST-RATE SWAPS

Swap-Rate Quotes

U.S. DOLLAR

| SECURITY |  | TIME | BID | ASK | CHANGE | OPEN | HIGH | LOW | PRV CLS |
|----------|--|------|-----|-----|--------|------|------|-----|---------|
|----------|--|------|-----|-----|--------|------|------|-----|---------|

U.S.\$SWAPS ABSOLUTE

|          |       |       |      |      |     |      |      |      |      |
|----------|-------|-------|------|------|-----|------|------|------|------|
| \$SWAPS2 | Index | 13.09 | 6.06 | 6.09 | +04 | 6.04 | 6.11 | 6.03 | 6.05 |
| \$SWAP3  | Index | 13.09 | 6.24 | 6.27 | +05 | 6.21 | 6.3  | 5.21 | 6.22 |
| \$SWAP4  | Index | 13.09 | 6.39 | 6.42 | +05 | 6.37 | 6.45 | 6.37 | 6.37 |
| \$SWAP5  | Index | 1.309 | 6.59 | 6.52 | +07 | 6.44 | 6.53 | 6.44 | 6.45 |
| \$SWAP7  | Index | 13.09 | 6.64 | 6.67 | +05 | 6.61 | 6.69 | 6.61 | 6.62 |
| \$SWAP10 | Index | 13.09 | 6.84 | 6.87 | +05 | 6.82 | 6.89 | 6.81 | 6.82 |
| \$SWAP15 | Index | 13.09 | 7.13 | 7.17 | +06 | 7.11 | 7.18 | 7.1  | 7.11 |
| \$SWAP20 | Index | 13.09 | 7.22 | 7.26 | +04 | 7.22 | 7.29 | 7.21 | 7.22 |
| \$SWAP30 | Index | 13.09 | 7.27 | 7.31 | +05 | 7.24 | 7.34 | 7.24 | 7.26 |

SEMI-ANN (ACT/ACT)

VS 6-MO U.S.\$LIBOR

LONDON INTERBANK

|         |       |      |      |       |  |       |       |       |       |
|---------|-------|------|------|-------|--|-------|-------|-------|-------|
| LIUS06M | INDEX | 6.00 | 5.75 | 5.875 |  | 5.875 | 5.875 | 5.875 | 5.875 |
|---------|-------|------|------|-------|--|-------|-------|-------|-------|

Exhibit 2

**VALUATION OF “PLAIN VANILLA” INTEREST-RATE SWAPS**

Eurodollar Futures Contract Specifications

|                                  |  |
|----------------------------------|--|
| Commodity:                       | Three-month Eurodollar Time Deposits   |
| Ticker Symbol:                   | ED   |
| Contract Size:                   | \$1,000,000  |
| Contract Months:                 | March, June, September, December   |
| Minimum Price Change:            | 1 bp (basis point) = \$25  |
| Price Limit:                     | None   |
| Trading Hours<br>(Chicago Time): | 7:20 am - 2:00 pm (last day-9:30 am)   |
| Last Day of<br>Trading:          | Second London business day prior to the third<br>Wednesday of the delivery month.                      |
| Delivery:                        | No delivery for Eurodollar futures. Settlement is in<br>cash. Final settlement on last day of trading. |

## Exhibit 3

## VALUATION OF "PLAIN VANILLA" INTEREST-RATE SWAPS

|               | <u>Open</u> | <u>High</u> | <u>Low</u> | <u>Settle</u> | <u>Chg</u> | <u>Yield</u>  |            | <u>Open</u>     |
|---------------|-------------|-------------|------------|---------------|------------|---------------|------------|-----------------|
|               |             |             |            |               |            | <u>Settle</u> | <u>Chg</u> | <u>Interest</u> |
| <b>Sep-95</b> | 94.22       | 94.27       | 94.20      | 94.26         | 0.04       | 5.74          | -0.04      | 572,429         |
| <b>Dec-95</b> | 94.22       | 94.33       | 94.22      | 94.32         | 0.10       | 5.68          | -0.10      | 358,942         |
| <b>Mar-96</b> | 94.21       | 94.33       | 94.21      | 94.31         | 0.10       | 5.69          | -0.10      | 297,932         |
| <b>Jun-96</b> | 94.07       | 94.18       | 94.05      | 94.17         | 0.10       | 5.83          | -0.10      | 200,783         |
| <b>Sep-96</b> | 93.94       | 94.03       | 93.92      | 94.02         | 0.11       | 5.98          | -0.11      | 168,515         |
| <b>Dec-96</b> | 93.73       | 93.82       | 93.72      | 93.81         | 0.09       | 6.19          | -0.09      | 145,111         |
| <b>Mar-97</b> | 93.69       | 93.77       | 93.67      | 93.76         | 0.09       | 6.24          | -0.09      | 121,782         |
| <b>Jun-97</b> | 93.60       | 93.67       | 93.58      | 93.67         | 0.09       | 6.33          | -0.09      | 103,897         |
| <b>Sep-97</b> | 93.51       | 93.60       | 93.51      | 93.59         | 0.09       | 6.41          | -0.09      | 80,127          |
| <b>Dec-97</b> | 93.38       | 93.46       | 93.38      | 93.46         | 0.09       | 6.54          | -0.09      | 70,035          |
| <b>Mar-98</b> | 93.36       | 93.44       | 93.36      | 93.44         | 0.09       | 6.56          | -0.09      | 60,246          |
| <b>Jun-98</b> | 93.30       | 93.37       | 93.30      | 93.37         | 0.08       | 6.63          | -0.08      | 54,456          |
| <b>Sep-98</b> | 93.25       | 93.31       | 93.24      | 93.31         | 0.07       | 6.69          | -0.07      | 41,385          |
| <b>Dec-98</b> | 93.15       | 93.21       | 93.14      | 93.20         | 0.06       | 6.80          | -0.06      | 35,166          |
| <b>Mar-99</b> | 93.14       | 93.20       | 93.13      | 93.19         | 0.06       | 6.81          | -0.06      | 30,628          |
| <b>Jun-99</b> | 93.08       | 93.14       | 93.07      | 93.13         | 0.06       | 6.87          | -0.06      | 25,432          |
| <b>Sep-99</b> | 93.02       | 93.07       | 93.01      | 93.07         | 0.06       | 6.93          | -0.06      | 17,042          |
| <b>Dec-99</b> | 92.83       | 92.97       | 92.92      | 92.98         | 0.06       | 7.02          | -0.06      | 13,599          |
| <b>Mar-00</b> | 92.93       | 92.97       | 92.92      | 92.98         | 0.06       | 7.02          | -0.06      | 10,988          |
| <b>Jun-00</b> | 92.87       | 92.91       | 92.86      | 92.92         | 0.06       | 7.08          | -0.06      | 9,272           |
| <b>Sep-00</b> | 92.82       | 92.85       | 92.82      | 92.86         | 0.05       | 7.14          | -0.05      | 8,235           |
| <b>Dec-00</b> | 92.73       | 92.76       | 92.73      | 92.77         | 0.05       | 7.23          | -0.05      | 6,460           |
| <b>Mar-01</b> | 92.73       | 92.76       | 92.77      | 92.77         | 0.05       | 7.23          | -0.05      | 6,156           |
| <b>Jun-01</b> | 92.66       | 92.69       | 92.66      | 92.70         | 0.05       | 7.30          | -0.05      | 6,810           |
| <b>Sep-01</b> | 92.62       | 92.63       | 92.61      | 92.64         | 0.05       | 7.36          | -0.05      | 7,228           |
| <b>Dec-01</b> | 92.54       | 92.55       | 92.53      | 92.56         | 0.05       | 7.44          | -0.05      | 6,870           |

Eurodollar 90-day Futures Contract Prices (WSJ June 17, 1995)

## Exhibit 4

**VALUATION OF “PLAIN VANILLA” INTEREST-RATE SWAPS**

Interest Payments from using Eurodollar Futures Contracts

| <b>Date</b> | <b>Futures Rates<br/>(Forward Rates)</b> | <b>Notional Interest<br/>Amount</b> | <b>Payment</b> |                   |
|-------------|--|-------------------------------------|----------------|-------------------|
| Jun-95      | 5.50                                     | \$50 million                        | \$ —           |                   |
| Sep-95      | 5.74                                     | 50 million                          | 687,500        | (.0550/4 × \$50M) |
| Dec-95      | 5.68                                     | 50 million                          | 717,500        | (.0574/4 × \$50M) |
| Mar-96      | 5.69                                     | 50 million                          | 710,000        |                   |
| Jun-96      | 5.83                                     | 50 million                          | 711,250        |                   |
| Sep-96      | 5.98                                     | 50 million                          | 728,750        |                   |
| Dec-96      | 6.19                                     | 50 million                          | 747,500        |                   |
| Mar-97      | 6.24                                     | 50 million                          | 773,750        |                   |
| June-97     | 6.33                                     | 50 million                          | 780,000        |                   |
| Sep-97      | 6.41                                     | 50 million                          | 791,250        |                   |
| Dec-97      | 6.54                                     | 50 million                          | 801,250        |                   |
| Mar-98      | 6.56                                     | 50 million                          | 817,500        |                   |
| Jun-98      | 6.63                                     | \$50 million                        | \$820,000      |                   |

Exhibit 5

**VALUATION OF INTEREST-RATE SWAPS**

Estimation of Spot Rates

| Date   |        | Futures Rates   | Date    |        | Months | Spot Rates |
|--------|--------|-----------------|---------|--------|--------|------------|
| From   | To     | (Forward Rates) | From    | To     |        |            |
| Jun-95 | Sep-95 | ---             | June-95 | Sep-95 | 3      | 5.50%      |
| Sep-95 | Dec-95 | 5.74            | Jun-95  | Dec-95 | 6      | 5.62       |
| Dec-95 | Mar-96 | 5.68            | Jun-95  | Mar-96 | 9      | 5.64       |
| Mar-96 | Jun-96 | 5.69            | Jun-95  | Jun-96 | 12     | 5.65       |
| Jun-96 | Sep-96 | 5.83            | Jun-95  | Sep-96 | 15     | 5.69       |
| Sep-96 | Dec-96 | 5.98            | Jun-95  | Dec-96 | 18     | 5.74       |
| Dec-96 | Mar-97 | 6.19            | Jun-95  | Mar-97 | 21     | 5.80       |
| Mar-97 | Jun-97 | 6.24            | Jun-95  | Jun-97 | 24     | 5.86       |
| Jun-97 | Sep-97 | 6.33            | Jun-95  | Sep-97 | 27     | 5.91       |
| Sep-97 | Dec-97 | 6.41            | Jun-95  | Dec-97 | 30     | 5.96       |
| Dec-97 | Mar-98 | 6.54            | Jun-95  | Mar-98 | 33     | 6.01       |
| Mar-98 | Jun-98 | 6.56            | Jun-95  | Jun-98 | 36     | 6.06%      |

## Exhibit 6

**VALUATION OF "PLAIN VANILLA" INTEREST-RATE SWAPS**

## Present Value of Eurodollar Futures Hedged Interest Payments

| <u>Date</u>         |        | Months | Spot<br>Rates | LIBOR<br>Payments | Present<br>Value |
|---------------------|--------|--------|---------------|-------------------|------------------|
| From                | To     |        |               |                   |                  |
| Jun-95              | Sep-95 | 3      | 5.50%         | 687,500           | \$678,175        |
| Jun-95              | Dec-95 | 6      | 5.62          | 717,500           | 697,755          |
| Jun-95              | Mar-96 | 9      | 5.64          | 710,000           | 680,795          |
| Jun-95              | Jun-96 | 12     | 5.65          | 711,250           | 672,428          |
| Jun-95              | Sep-96 | 15     | 5.69          | 728,750           | 679,075          |
| Jun-95              | Dec-96 | 18     | 5.74          | 747,500           | 686,287          |
| Jun-95              | Mar-97 | 21     | 5.80          | 773,750           | 699,562          |
| Jun-95              | Jun-97 | 24     | 5.86          | 780,000           | 694,380          |
| Jun-95              | Sep-97 | 27     | 5.91          | 791,250           | 693,422          |
| Jun-95              | Dec-97 | 30     | 5.96          | 801,250           | 691,110          |
| Jun-95              | Mar-98 | 33     | 6.01          | 817,500           | 693,783          |
| Jun-95              | Jun-98 | 36     | 6.06%         | 820,000           | 684,676          |
| Total Present Value |        |        |               |                   | \$8,251,448      |

Figure 1

**VALUATION OF "PLAIN VANILLA" INTEREST-RATE SWAPS**

**LIBOR 3-Month Rates**

