Problem 7.5.

The swap involves exchanging the sterling interest of $20 \times 0.14 = 2.8$ million for the dollar interest of $30 \times 0.1 = \$3$ million. The principal amounts are also exchanged at the end of the life of the swap. The value of the sterling bond underlying the swap is

$$\frac{2.8}{(1.11)^{1/4}} + \frac{22.8}{(1.11)^{5/4}} = 22.739 \text{ million pounds}$$

The value of the dollar bond underlying the swap is

$$\frac{3}{(1.08)^{1/4}} + \frac{33}{(1.08)^{5/4}} = \$32.916 \text{ million}$$

The value of the swap to the party paying sterling is therefore

$$32.916 - (22.739 \times 1.65) = -\$4.604 \text{ million}$$

The value of the swap to the party paying dollars is +\$4.604 million. The results can also be obtained by viewing the swap as a portfolio of forward contracts. The continuously compounded interest rates in sterling and dollars are 10.436% per annum and 7.696% per annum. The 3-month and 15-month forward exchange rates are $1.65e^{-(0.10436-0.07696)\times 0.25} = 1.6387$ and $1.65e^{-(0.10436-0.07696)\times 1.25} = 1.5944$. The values of the two forward contracts corresponding to the exchange of interest for the party paying sterling are therefore

$$(3 - 2.8 \times 1.6387)e^{-0.07696\times 0.25} = -\$1.558 \text{ million}$$

$$(3 - 2.8 \times 1.5944)e^{-0.07696\times 1.25} = -\$1.330 \text{ million}$$

The value of the forward contract corresponding to the exchange of principals is

$$(30 - 20 \times 1.5944)e^{-0.07696\times 1.25} = -\$1.716 \text{ million}$$

The total value of the swap is $-\$1.558 - \$1.330 - \$1.716 = -\$4.604$ million.

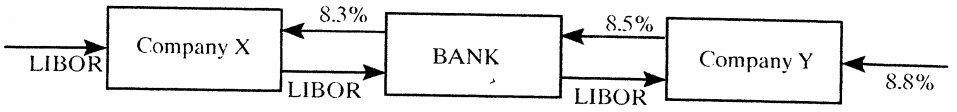
Problem 7.6.

Credit risk arises from the possibility of a default by the counterparty. Market risk arises from movements in market variables such as interest rates and exchange rates. A complication is that the credit risk in a swap is contingent on the values of market variables. A company's position in a swap has credit risk only when the value of the swap to the company is positive.

Problem 7.7.

The rate is not truly fixed because, if the company's credit rating declines, it will not be able to roll over its floating rate borrowings at LIBOR plus 150 basis points. The effective fixed borrowing rate then increases. Suppose for example that the treasurer's spread over LIBOR increases from 150 basis points to 200 basis points. The borrowing rate increases from 5.2% to 5.7%.

Figure S7.3: Swap for Problem 7.9



Problem 7.8.

At the start of the swap, both contracts have a value of approximately zero. As time passes, it is likely that the swap values will change, so that one swap has a positive value to the bank and the other has a negative value to the bank. If the counterparty on the other side of the positive-value swap defaults, the bank still has to honor its contract with the other counterparty. It is liable to lose an amount equal to the positive value of the swap.

Problem 7.9.

The spread between the interest rates offered to X and Y is 0.8% per annum on fixed rate investments and 0.0% per annum on floating rate investments. This means that the total benefit to all parties from the swap is 0.8% per annum. Of this 0.2% per annum will go to the bank. This leaves 0.3% per annum for each of X and Y. In other words, company X should be able to get a fixed-rate return of 8.3% per annum while company Y should be able to get a floating-rate return LIBOR + 0.3% per annum. The required swap is shown in Figure S7.3. The bank earns 0.2%, company X earns 8.3%, and company Y earns LIBOR + 0.3%. This assumes that company X can continue to roll over the funds at LIBOR.

Problem 7.10.

At the end of year 3 the financial institution was due to receive \$500,000 ($= 0.5 \times 10\%$ of \$10 million) and pay \$450,000 ($= 0.5 \times 9\%$ of \$10 million). The immediate loss is therefore \$50,000. To value the remaining swap we assume than forward rates are realized. All forward rates are 8% per annum. The remaining cash flows are therefore valued on the assumption that the floating payment is $0.5 \times 0.08 \times 10,000,000 = \$400,000$ and the net payment that would be received is $500,000 - 400,000 = \$100,000$. The total cost of default is therefore the cost of foregoing the following cash flows:

year 3:	\$50,000
year $3\frac{1}{2}$:	\$100,000
year 4:	\$100,000
year $4\frac{1}{2}$:	\$100,000
year 5:	\$100,000

Discounting these cash flows to year 3 at 4% per six months we obtain the cost of the default as \$413,000.