

Origins of currency swaps

Currency swaps originally were developed by banks in the UK to help large clients circumvent UK exchange controls in the 1970s.

- UK companies were required to pay an exchange equalization premium when obtaining dollar loans from their banks.

How to avoid having to pay this premium?

An agreement would then be negotiated whereby

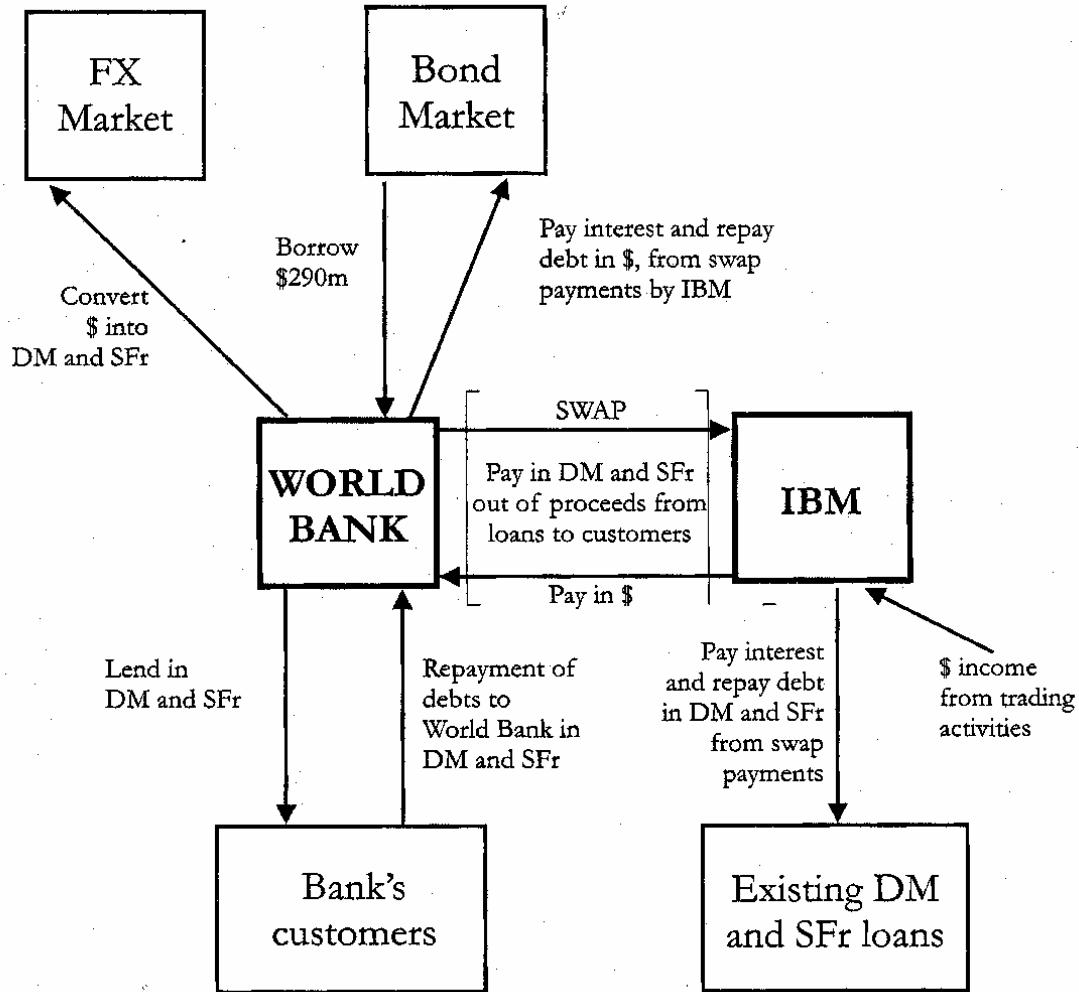
- The UK organization borrowed sterling and lent it to the US company's UK subsidiary.
- The US organization borrowed dollars and lent it to the UK company's US subsidiary.

These arrangements were called back-to-back loans or parallel loans.

IBM / World Bank with Salomon Brothers as intermediary

- IBM had existing debts in DM and Swiss francs. Due to a depreciation of the DM and Swiss franc against the dollar, IBM could realize a large foreign exchange gain, but only if it could eliminate its DM and Swiss franc liabilities and “lock in” the gain.
- The World Bank was raising most of its funds in DM (interest rate = 12%) and Swiss francs (interest rate = 8%). It did not borrow in dollars, for which the interest rate cost was about 17%. Though it wanted to lend out in DM and Swiss francs, the bank was concerned that saturation in the bond markets could make it difficult to borrow more in these two currencies at a favorable rate.

World Bank/IBM Currency Swap, 1981



IBM / World Bank

- IBM was willing to take on dollar liabilities and made dollar payments to the World Bank since it could generate dollar income from normal trading activities.
- The World Bank could borrow dollars, convert them into DM and SFr in FX market, and through the swap take on payment obligations in DM and SFr.

Remark

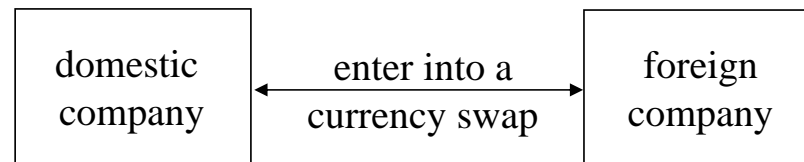
1. The swap payments by the World Bank to IBM were scheduled so as to allow IBM to meet its debt obligations in DM and SFr.
2. IBM and the World Bank had AAA-ratings; therefore, the counterparty risk was low.

Exploiting comparative advantages

A domestic company has comparative advantage in domestic loan but it wants to raise foreign capital. The situation for a foreign company happens to be reversed.

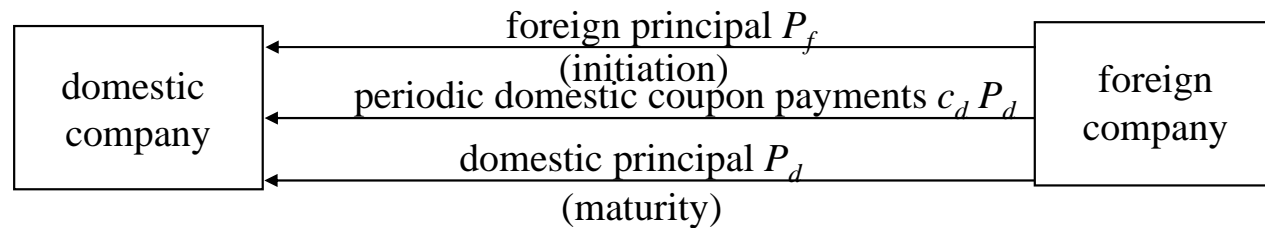
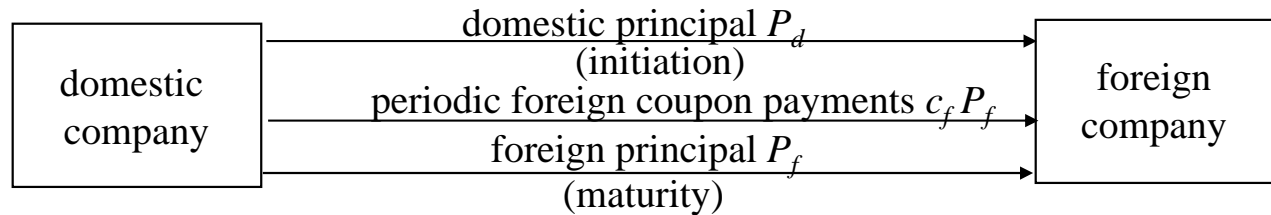


$$P_d = F_0 P_f$$



Goal: To exploit the comparative advantages in borrowing rates for both companies in their domestic currencies.

*Cashflows between the two currency swap counterparties
(assuming no intertemporal default)*



Settlement rules

Under the full (limited) two-way payment clause, the non-defaulting counterparty is required (not required) to pay if the final net amount is favorable to the defaulting party.

Cross currency transactions

- The associated cash flows are denominated in different monetary units, the principal amounts are usually exchanged at the origination and maturity dates. The exchange rate used can be either fixed or floating at the prevailing rate at the time of transaction.
- The two interest rates can be either fixed or floating.

Quoting prices

Example

The following rates are quoted for 3-year cross currency interest rate swap against the dollar.

Canadian dollars 6.50 – 6.75% (dealing spread of 25 bps)

Sterling 7.74 – 7.94% (dealing spread of 20 bps)

The quoted rates are the fixed rates that the bank will pay (lower rate) or receive (higher rate) in a cross-currency interest rate swap where the counterparty will receive or pay interest at 6-month dollar LIBOR.

Comparison with forward contracts

Forward exchange contract – involves an agreement now for the sale or purchase of a quantity of one currency in exchange for another currency at a specified future date. The rate of exchange is the spot adjusted for the interest rate differential between the two currencies over the period of the forward contract – interest rate parity relation.

How currency swaps differ from outright forward contracts?

- There is often an exchange of principal at initiation.
- Interest usually is exchanged at regular intervals during the swap period.
- The regular exchange of interest means that the re-exchange of principal at maturity can be at today's spot rate.
- The period of a swap is longer than that for most forward contracts.

Arranging finance in different currencies

The company issuing the bonds can use a currency swap to issue debt in one currency and then swap the proceeds into the currency it desires.

Three specific purposes

- To obtain lower cost funds.
Suppose there is a strong demand for investments in currency A, a company seeking to borrow in currency B could issue bonds in currency A at a low rate of interest and swap them into the desired currency B.
- To gain access to a restricted capital market.
- To obtain funding in a form not otherwise available.
Market conditions might preclude the issuance of long term debt bearing a fixed interest rate in Yen.

Hedging currency exposures

- Long term investment (liability) in a currency that generates (pays) a stream of cashflows – exposure to a fall (rise) in the value of the currency.
- To gain access to a restricted capital market.
- To obtain funding in a form not otherwise available.
Market conditions might preclude the issuance of long term debt bearing a fixed interest rate in Yen.

Locking in a forward rate

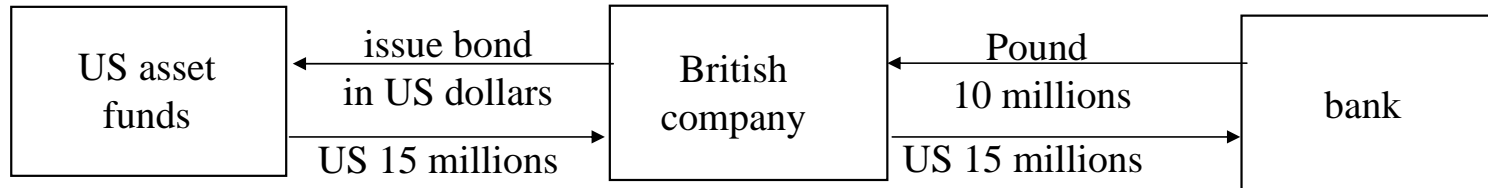
Currency swaps can be used to lock in a forward rate for a future foreign currency receipt or payment, either as an alternative to a forward exchange contract, or when a forward contract is unobtainable.

Asset currency swaps

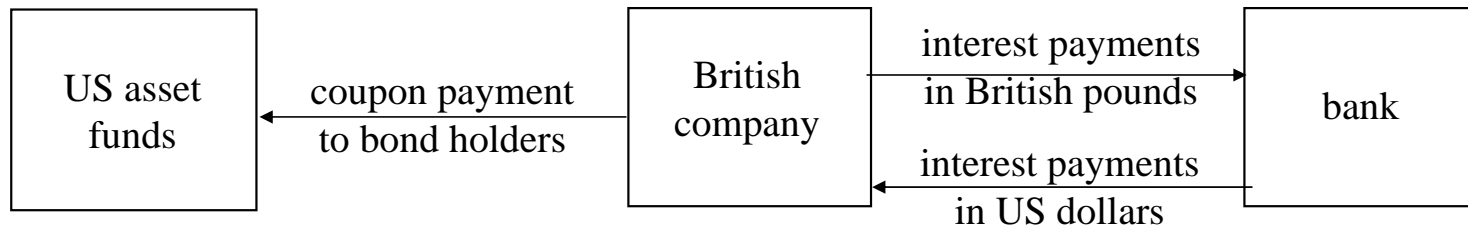
A British company has difficulties to raise capital in Pounds, but there exist US asset fund managers who are willing to buy bonds in US dollars issued by the British company.

- By entering into a currency swap with a bank, the British company can raise the Pounds that it wants.

Initiation:



Intermediate interest payments:



Maturity of bond and swap:



Basis swaps

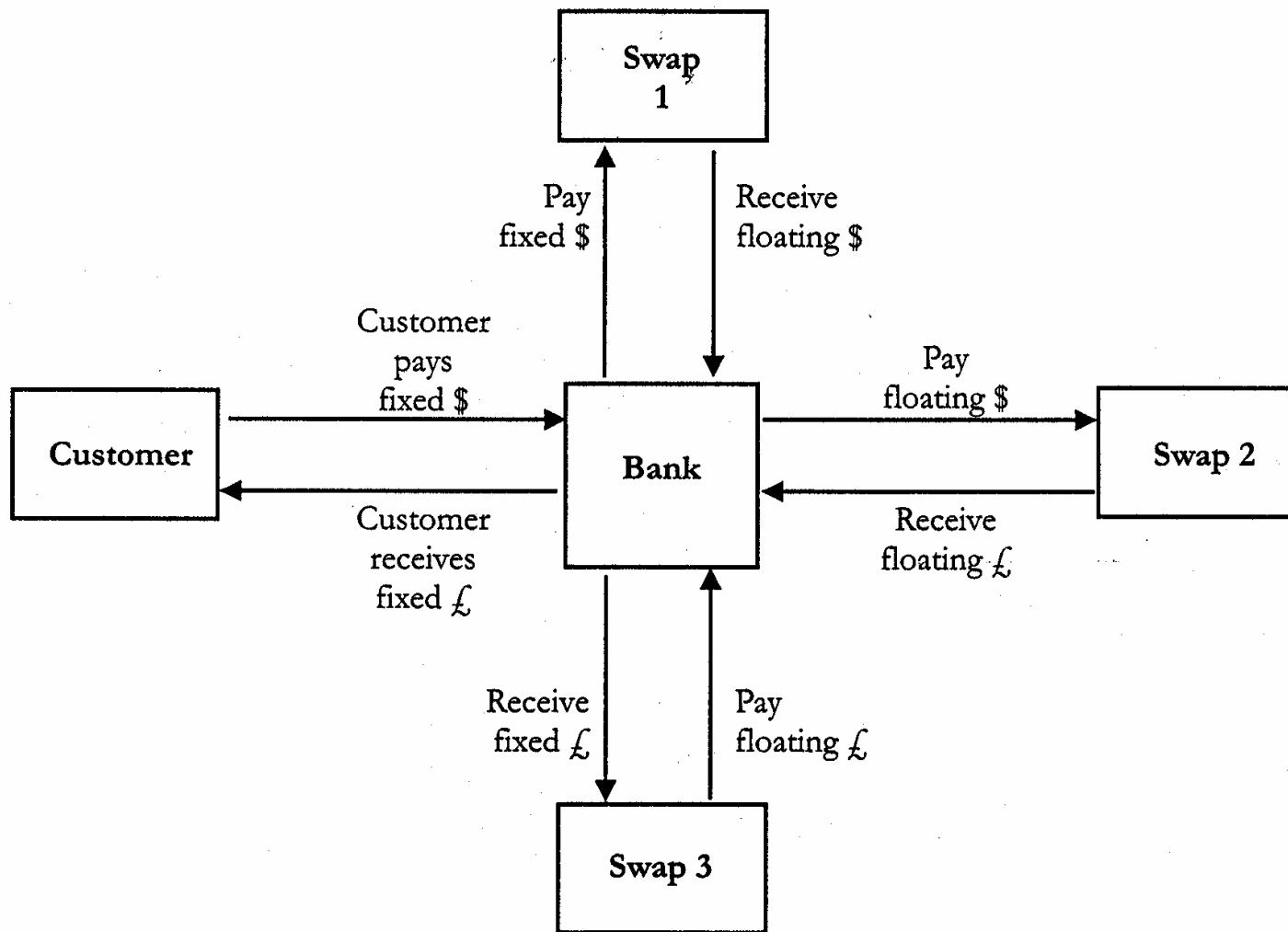
Basis swaps involve swapping one floating index rate for another.

Banks may need to use basis swaps to arrange a currency swap for the customers.

Example

A customer wants to arrange a swap in which he pays *fixed* dollars and receives *fixed* sterling. The bank might arrange 3 other separate swap transactions:

- an interest rate swap, fixed rate against floating rate, in dollars
- an interest rate swap, fixed sterling against floating sterling
- a currency basis swap, floating dollars against floating sterling



Hedging the bank's risk

Exposures arise from mismatch in dates and amounts of payments.

Hedging methods

- If the bank is paying (receiving) a fixed rate on a swap, it could buy (sell) government bonds as a hedge.
- If the bank is paying (receiving) a variable rate, it can hedge by lending (borrowing) in the money markets.

When the bank finds a counterparty to transact a matching swap in the opposite direction, it will liquidate its hedge.

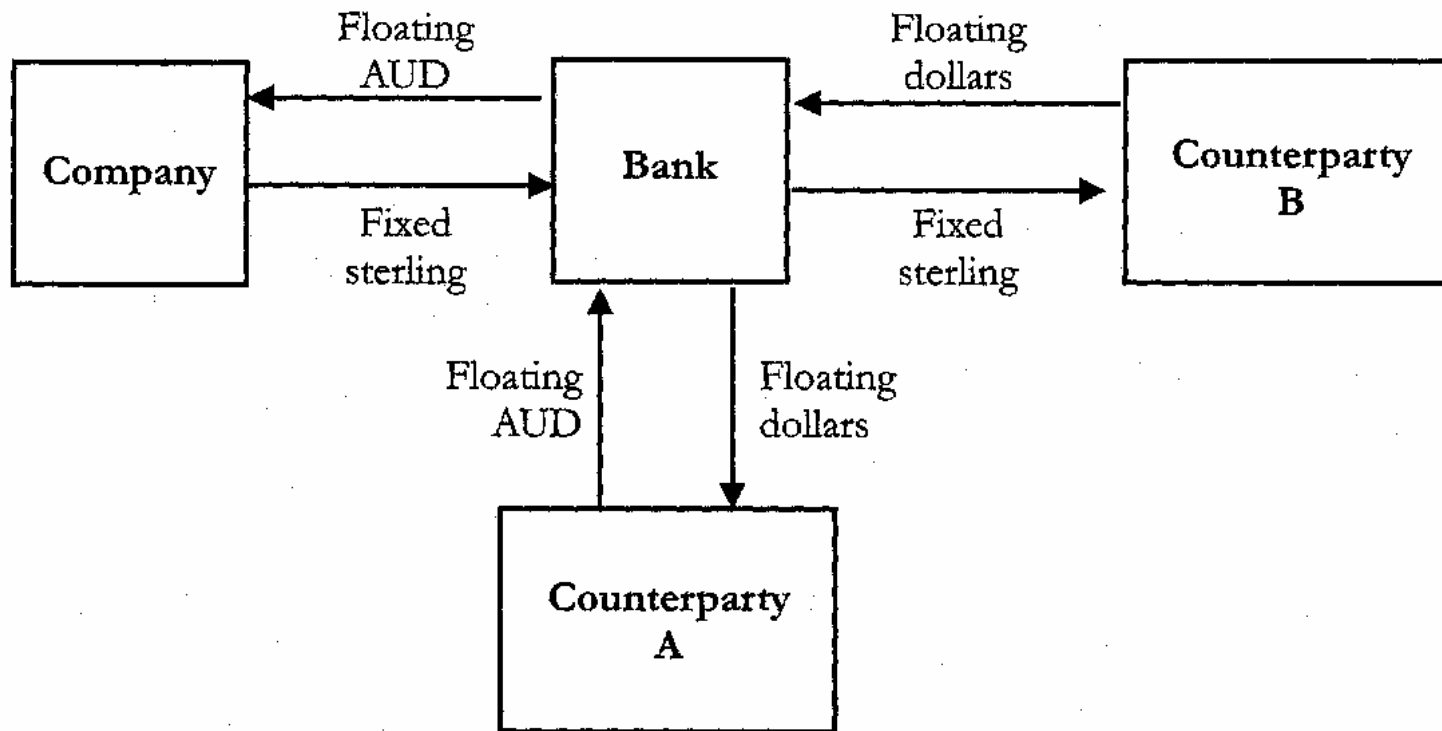
Multi-legged swaps

In a multi-legged swap a bank avoids taking on any currency risk itself by arranging three or more swaps with different clients in order to match currencies and amounts.

Example

A company wishes to arrange a swap in which it receives floating rate interest on Australian dollars and pays fixed interest on sterling.

- a fixed sterling versus floating Australian dollar swap with the company
- a floating Australian dollar versus floating dollar swap with counterparty A
- a fixed sterling versus dollar swap with counterparty B



Amortizing swaps

The principal amount is reduced progressively by a series of re-exchanging during the life of the swap to match the amortization schedule of the underlying transaction.

Example

A company has an outstanding dollar loan that is being paid off gradually over 3 years. The company would like to swap this dollar liability into a sterling liability.

- An exchange of principal at initiation – receives sterling in exchange for dollars.
- An annual re-exchange of part of the principal amount – receives sufficient dollars each year to meet the repayment schedule on its loan.
- Regular exchanges of interest.

Semi-fixed swap with a FOREX trigger

The buyer links its forex and interest rate exposures and produces an integrated hedge. Hedging the various underlying exposures separately often results in higher hedging costs, as the company is likely to be over hedged.

Example

The swap rate is 5%, the company would pay

- a lower rate, such as 4.5%, when the DM is above a trigger of DM 1.75 to the US dollar;
- a higher rate, such as 6.5%, when the DM is below the trigger.

The three parameters in this structure makes the product more flexible than plain vanilla swaps.

THB/USD Gradual Annuity Swap

Counterparties: Goldman Sachs Capital Markets, L.P.
Counterparty

Maturity Date: 5 years from the Effective Date

USD Notional Amount: Amortizing as per USD Notional Schedule

THB Notional Amount: Amortizing as per THB Notional Schedule

Initial Principal Exchange: None

Principal Exchanges: On each Principal Exchange Date as per the Notional Schedule:
Counterparty pays THB Amortization Amount
GSCM pays USD Amortization Amount

Interest Period: Semi-annual Act/360 from the Effective Date

Period Payments: If $MAX < 45.00$
 Counterparty pays 4.90%
 If $MAX > 55.00$
 Counterparty pays 9.90%
 Otherwise
 Counterparty pays $4.90\% + 0.5 (MAX - 45.00)\%$
 on USD Notional Amount

MAX: Maximum trade of THB/USD during the semi-annual
 Interest Period as determined by Calculation Agent

Business Days: New York, London and Bangkok

Example: If Maximum trade of THB/USD during a semiannual
 period is 52.00, then coupon for that period is
 $4.90 + 0.5 * 7.00\% = 8.40\%$

Differential Swap (Quanto Swap)

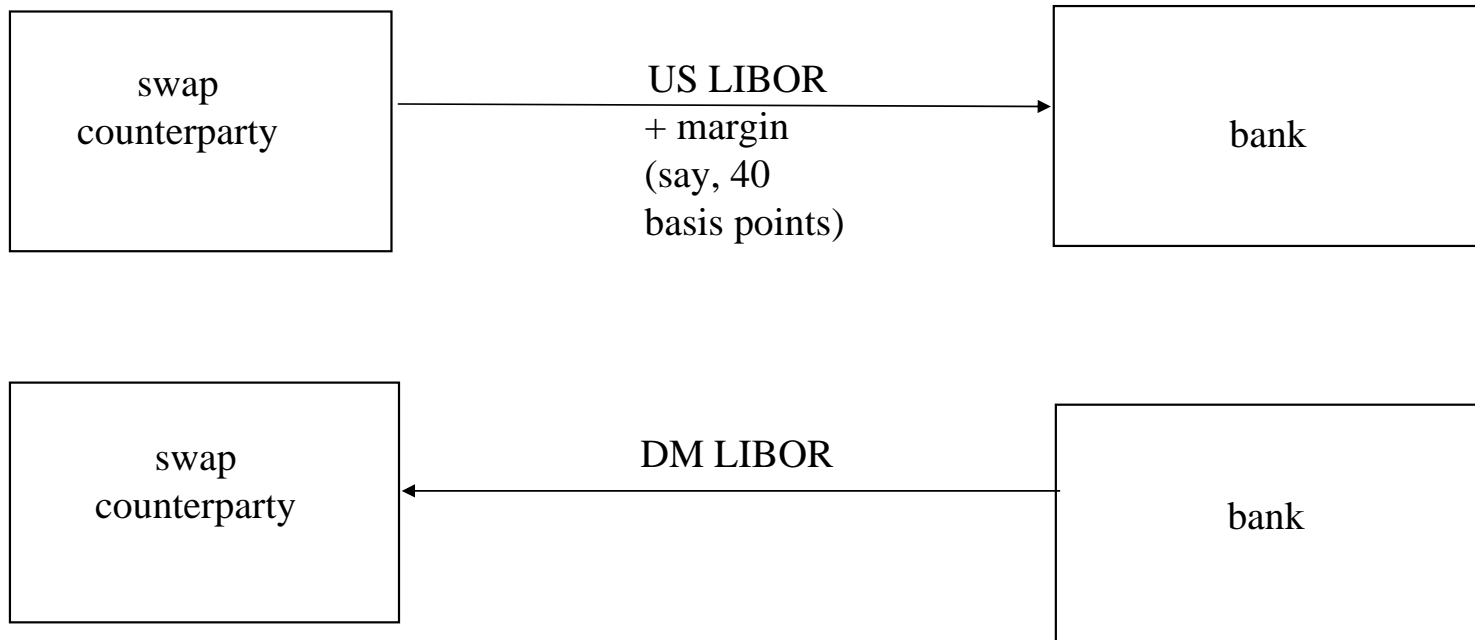
A special type of floating-against-floating currency swap that does not involve any exchange of principal, not even at maturity.

- The notional principal amount is in just one currency.
- Interest payments are exchanged by reference to a floating rate index in one currency and a floating rate index in a second currency. Both interest rates are applied to the same notional principal.
- Interest payments are made in the same currency as the notional principal amount.

A simple example of differential swap

The semi-annual interest streams will be paid in dollars.

- six-month dollar LIBOR of 5.25% plus margin (reset every 6 months)
- six-month DM LIBOR of 6.75% (reset every 6 months)
- notional principal = \$10 (million)



Uses of differential swaps

The diff swap requires the swap dealer to pay DEM LIBOR plus 1.85 percent in exchange for Sterling LIBOR, with both rates translated into cash flows using the same GBP 10 million notional principal.

- The tenor of this agreement, which specified quarterly settlements, was two years.

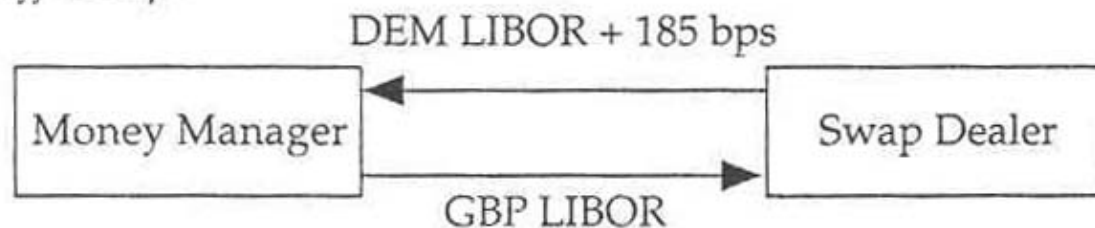
Question

Assuming that the swap dealer has left this position unhedged, what is the implicit view he is taking with respect to rate changes in the United Kingdom and Germany?

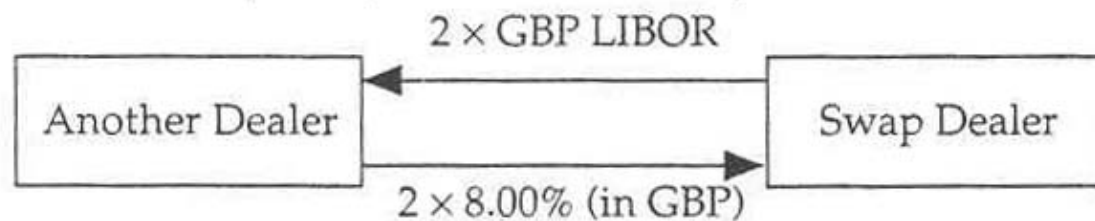
Answer

- The dealer is implicitly assuming that the differential between the British and German short-term rates will widen more rapidly, and by a greater amount, than the current market view.
- Either the German rates fall as British rates rise, or Sterling LIBOR rises at an accelerated pace relative to DM LIBOR.

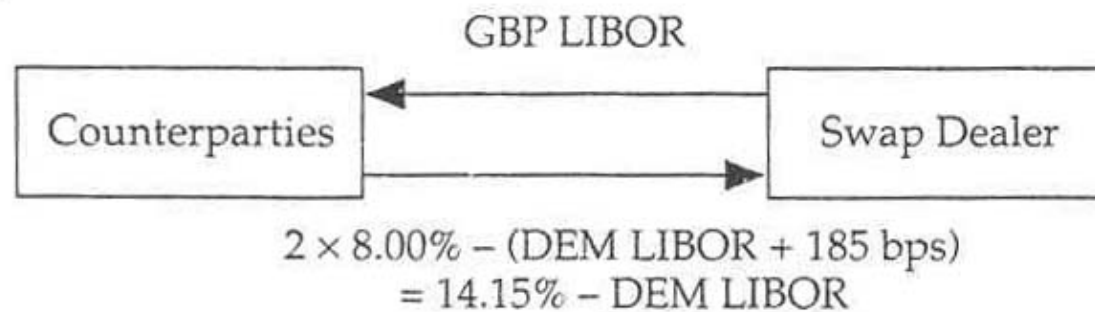
One diff swap



plus two receive-fixed plain vanilla swaps



equals



Given that the present pound and DM LIBOR differential (i.e., 110bps = 6.25% - 5.15%) is less than the 185-basis-point swap spread differential, he will be required to make the first net settlement payment. Suppose that bid-ask fixed rates on two-year, sterling-denominated, plain vanilla swaps (against three-month sterling LIBOR) are currently being quoted in the inter-bank market at 8.00% and 8.05%, respectively.

Questions

- What combination of transactions would be needed to transform the diff swap into a contract by which the dealer receives a cash flow of the form (constant percent – DM LIBOR) and pays sterling LIBOR?
- After the transactions, is it consistent with the implied view proposed earlier?

Answers

- The desired transformation could be made by combining a pay-DM LIBOR / receive-sterling LIBOR diff swap position with two receive-8.00% fixed/pay-sterling LIBOR swaps (or one for twice the GBP 10 million principal).
- Notice that the dealer's initial net cash flow on the combined transaction is now positive, with value equals 2.75% [obtained as $(14.15\% - 5.15\%) - 6.25\%$].
- Although the dealer still benefits from a German or British rate decline, an increase in either rate - regardless of the size of the differential between them - will erode this advantage.

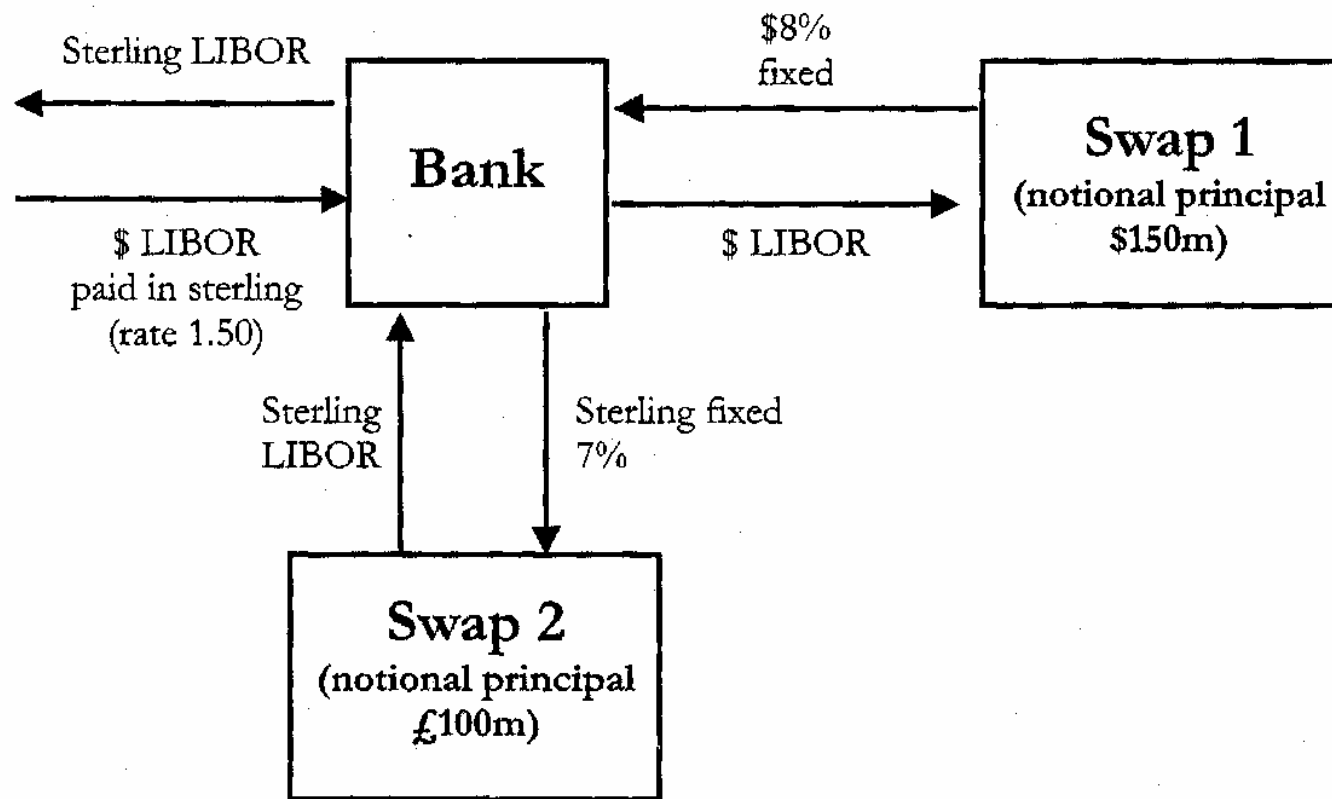
Thus, the new position creates a markedly different exposure for the dealer than did the original diff swap.

Hedging of differential swap

A client of the Bank has existing borrowings in sterling, paying floating rate interest linked to sterling LIBOR. The client would like to pay the lower interest rate available on the dollar, but does not want currency exposure to the dollar.

| | dollars | Sterling |
|----------------|---------|----------|
| 3 months LIBOR | 3% | 9% |
| 5 years fixed | 8% | 7% |

The client enters a diff swap with the Bank, paying \$LIBOR paid in sterling (rate of 1.50) and receiving Sterling LIBOR.



Bank's viewpoint on the structure

The bank need to take two offsetting swaps with two other parties.

- An interest rate swap, fixed rate of 8% against floating LIBOR, in dollars (notional principal of 150m dollars).
- An interest rate swap, fixed rate of 7% against floating LIBOR, in Sterling (notional principal of 100m Pounds).

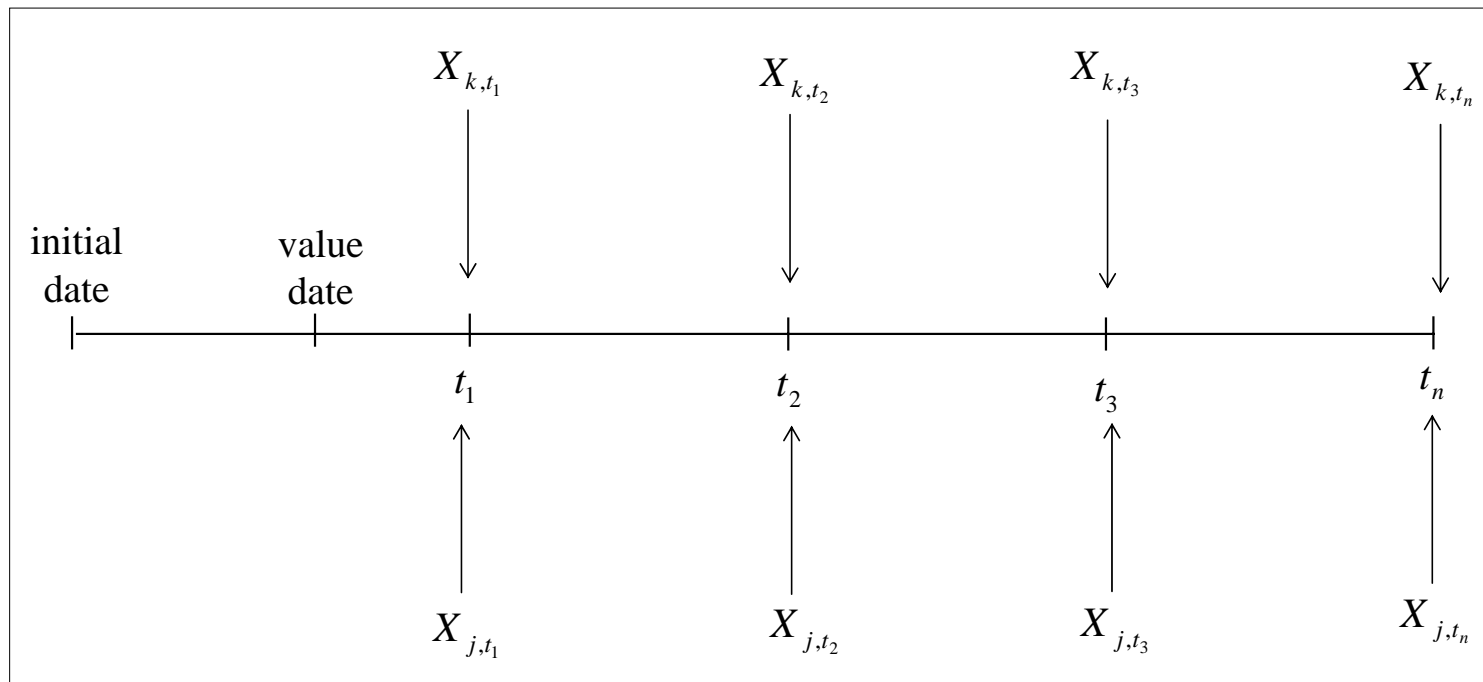
The bank is exposed to changes in the dollar / sterling exchange rate (need to take measures to hedge such positions).

Pricing for a differential swap

The net difference in swap rates of the currencies involved, plus the cost of hedging the bank's currency risk.

Pricing of currency swaps

The swap rates are set such that the value of currency swap at initiation is zero. The swap value at a future date depends on the interest rates in the two currencies, r_d and r_f , and the foreign exchange rate F .



The payment dates for the swap cash flows are t_1, t_2, \dots, t_n .

Let $V_{j,t}$ be the swap value in currency j at time t , B_{h,t,t_i} is the discount factor at time t for maturity t_i in currency h , $h = j, k$.

$F_{j,k,t}$ is the spot exchange rate, the price in terms of currency j of currency k at time t .

$$V_{j,t} = \left[X_{k,t_1} B_{k,t,t_1} + X_{k,t_2} B_{k,t,t_2} + \cdots + X_{k,t_n} B_{k,t,t_n} \right] F_{j,k,t} - \left[X_{j,t_1} B_{j,t,t_1} + X_{j,t_2} B_{j,t,t_2} + \cdots + X_{j,t_n} B_{j,t,t_n} \right]$$

The valuation involves discounting the future cash flow streams in the two currencies.