

Chapter VII

INTEREST RATE AND CURRENCY SWAPS

PROBLEMS

Problem 1

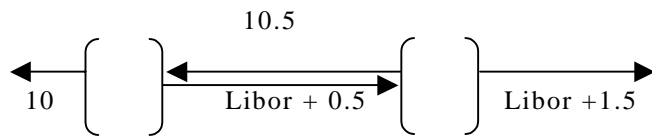
Two companies A & B have identical dollar borrowing requirements. A prefers floating rate funding and B fixed rate funding. The interest rates applicable to A & B are as given below.

	Floating	Fixed
A	LIBOR + 0.5%	10%
B	LIBOR + 1.5%	12%

Explain how they can use an interest rate swap profitably.

Solution

A has an absolute advantage of 1% in the floating rate and 2% in the fixed rate markets. If A accesses the fixed rate markets and B the floating rate markets, the net advantage for A & B will be 2% - 1%. Let us assume that the benefit of 1% is shared equally between A & B. Then the deal can be structured as explained below.



Effective cost of funding for A = $10 + \text{LIBOR} + 0.5\% - 10.5\% = \text{LIBOR}$

Effective cost of funding for B = $10.5 + \text{LIBOR} + 1.5\% - (\text{LIBOR} + 0.5\%) = 11.5\%$

Note that A has borrowed fixed rate funds but has successfully converted repayment into a floating rate liability. B has done exactly the reverse.

Problem 2

In the above problem, assume that an intermediary is needed to structure the deal. The

intermediary wants a spread of 0.2%. Explain how the deal can be structured, assuming again that the net benefit is shared equally between A & B.

Solution

The deal can be structured as indicated below.

Net cost of funding for A

$$= 10 + \text{LIBOR} + 0.5\% - 10.4\% = \text{LIBOR} + 0.1\%$$

Net cost of funding for B

$$= 10.5\% + \text{LIBOR} + 1.5\% - (\text{LIBOR} + 0.4\%) = 11.6\%$$

Benefit to intermediary

$$\begin{aligned} &= -(\text{LIBOR} + 0.4 + 10.4) + (\text{LIBOR} + 0.5\% + 10.5\%) \\ &= 0.2\% \end{aligned}$$

Problem 3

A corporate has a target Debt to Equity ratio (D/E) of 2 : 1. For a new project, the company plans to use Rs 30 lakhs of own funds. Its current Profit after Tax is Rs 18 lakhs and Return on Equity (ROE) 20%. The company would like to maintain its current ROE. The tax rate applicable to the company is 50%. It is expected that the project will generate additional profit before tax of Rs 18 lakhs every year. Explain how the company can use an interest 18 lakhs every year. Explain how the company can use an interest rate swap to achieve its target ROE and D/E given the following.

	Fixed rate	Floating rate
Corporate	10.5%	LIBOR + 2%
Bank	8.0%	LIBOR + 1%

Solution

Let PBT denote Profit before Tax

PAT denote Profit after Tax

D denote Debt

E denote Equity

i denote interest rate

Additional debt which the company can raise is $(2) (30) = \text{Rs } 60 \text{ lakhs}$.

Current Profit before tax $= 18/0.5 = \text{Rs } 36 \text{ lakhs}$.

PBT after the loan has been raised = $36 + 18 - 60i$

$$\text{PAT} = (54 - 60i) (0.5)$$

$$\text{ROE} = \text{PAT}/E$$

So before the loan is raised, $E = \text{PAT}/\text{ROE} = 18/0.2 = \text{Rs } 90 \text{ lakhs.}$

Since $\text{ROE} > .20$

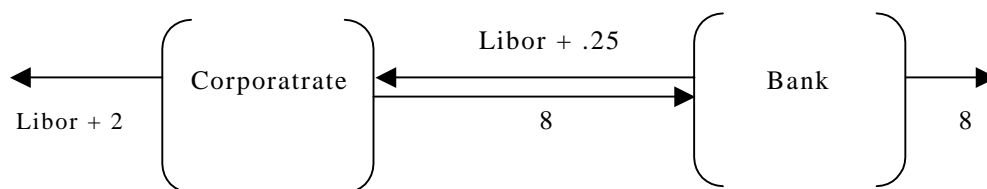
$$(54 - 60i) (0.5) / (120) > 0.20$$

So $i < 10\%$.

The company thus has to ensure that its cost of borrowing is less than 10%. As it is likely to prefer fixed rate loan which is available only at 10.5%, the company would have to explore the possibility of a swap.

The bank has an absolute advantage of 2.5% in fixed rate and 1% in floating rate markets. Thus, by entering into a swap agreement with the bank which in all probability would be in need of floating rate funds, the cost of borrowing can be reduced.

The net advantage if the bank accesses the fixed rate and the corporate the floating rate markets is $2.5\% - 1\% = 1.5\%$. Let us assume that the benefit can be shared equally. In that case, the deal can be structured as given below.



$$\text{Cost of funds for corporate} = \text{LIBOR} + 2\% - (\text{LIBOR} + .25\%) + 8\% = 9.75\%$$

$$\begin{aligned} \text{Cost of funds for Bank} &= 8\% - 8\% + \text{LIBOR} + 0.25\% \\ &= \text{LIBOR} + 0.25\% \end{aligned}$$

Problem 4

Two companies A & B face the following borrowing rates.

	Dollars	Sterlings
A	7.0%	10.6%
B	9.0%	11.0%

A wants to borrow in sterlings and B prefers to borrow in \$. Assuming the exchange rate is \$1.5/£ explain how a currency swap can be structured.

Solution

In this case, the comparative advantage for A, who is obviously the party with the higher credit rating is in dollar borrowing. If A borrows in \$ and B in sterlings, the net total advantage = $(9.0\% - 7.0\%) - (11.0\% - 10.6\%) = 1.6\%$. Let us assume that this benefit will be shared equally between A & B. Further, A and B will have to borrow in the ratio of 1.5 :1. That is, if A borrows \$ 1.5 million, B will borrow £1 million.

At the beginning of the swap, A will give B \$ 1.5 million and in turn receive £ 1 million from B.

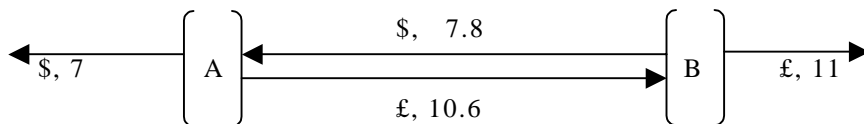
During the tenure of the loans, A will pay B sterling interest at the rate of 10.6%. It will pay dollar interest at the rate of 7% to its lender. A will also receive dollar interest at the rate of 7.8% from B.

As far as B is concerned, it will pay sterling interest at the rate of 11% to its borrower. It will pay dollar interest at the rate of 7.8% to A. It will receive sterling interest at the rate of 10.6% from A.

By this arrangement, A can access a loan in \$ but its interest liability is converted into sterlings. B raises a sterling loan but its interest liability is converted into dollars.

At the end of the swap, A will give B £ 1 million to enable it to repay the sterling loan. B will give A \$1.5 million so that A can repay its dollar loan.

The swap can be depicted pictorially as shown below.



Net interest outflow for A each year

$$\begin{aligned}
 &= \$ (0.07) (1.5) + £ (0.1060) (1) - \$ (0.078) (1.5) \\
 &= £. 098 \text{ million (by applying the exchange rate of \$1.5/£)}
 \end{aligned}$$

Net interest outflow for B each year

$$= \$ (0.078) (1.50) + £ (0.11) (1) - £ (0.106) (1)$$

= \$.1230 million.

Without the swap arrangement, the costs would have been

A: $(0.106)(1) = \text{£ } 0.106$ million

B: $(0.09)(1.5) = \$ 0.135$ million

Clearly, the swap has benefited both parties.

Problem 5

Company A wishes to borrow dollars and B yens. The interest rates applicable to A & B are as follows.

	Yens	Dollars
A	4.0%	8.5%
B	5.5%	9.0%

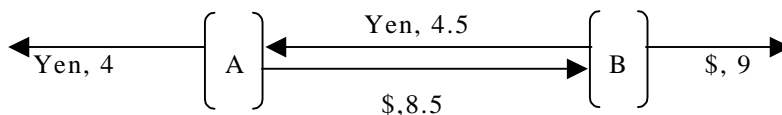
The exchange rate is currently 120 yens/\$. Explain how you can structure a currency swap.

Solution

Assume A wants to borrow \$ 1 million. Then B can borrow approximately Yen 120 million.

If A borrows in yens and B in \$, both parties can benefit. The comparative advantage in that case = $(5.5-4.0) - (9.0-8.5) = 1.0\%$.

The benefit, say, is shared equally between A & B. Then, the deal can be structured as follows.



A borrows Yen 120 million and B \$ 1 million. They exchange the principal amounts.

A pays interest of Yen $(0.040)(120)$ million to its lender.

A receives interest of Yen $(0.045)(120)$ million from B.

A pays interest of \$ $(.085)(1)$ million to B.

Net cost = yen $(.04)(120) - \text{Yen } (.045)(120) + \$ (.085)(1)$
= \$.08 million (applying exchange rate of Yen 120/\$)

B pays interest of \$ $(.09)(1)$ million to its lender.

It receives interest of \$ (0.085) (1) million from A.
 It pays interest of Yen (0.045) (120) million to A.
 Net cost = \$ (0.09) (1) - \$ (.085) (1) + Yen (.045) (120)
 = Yen 6 million.

At the end of the swap, A receives Yen 120 million from B and B receives \$ 1 million from A. These amounts are used to repay the loans.

Hence, net savings as a result of the swap

for A : $(0.085) (1) - 0.08 = \$ 0.005 \text{ million} = \5000 .
 for B : $(.055) (120) - 6 = \text{Yen } 0.6 \text{ million} = \text{Yen } 600,000$.

Problem 6

Moon Corporation, an US based company wants to raise fixed rate 10 year dollar funds. However, it finds that since its rating is not top quality, the spread that it has to pay over the top rated borrower is less in the continental market than in the U. S. market. It has thus decided to raise a DM loan at 6.5%.

Sun Corporation, another US company, can raise funds in the US market at 11.5%. It can raise DM funds in the continental market at 6%.

If Moon corporation raises funds from the US market it has to pay 1% premium over a top rated firm like Sun Corporation.

Now, Sun Corporation wants to swap in order to achieve DM fixed liability while Moon corporation wants to achieve \$ fixed liability.

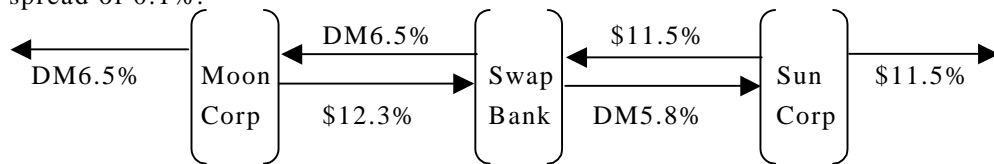
You are required to structure a swap deal.

Solution

	Moon Corp.	Sun Corp.
Requirement	Fixed \$ liability	Fixed DM liability
Cost of \$ funding	12.5%	11.5%

Cost of DM funding	6.5%	6%
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Moon Corporation has a comparative advantage over Sun Corporation in the continental market though Sun Corporation has absolute advantage over Moon Corporation in both the markets. Thus, Moon Corporation can raise fixed rate DM Loan from the continental market and Sun Corporation can raise funds from the US market in fixed rate \$. Then they can enter into a Dollar - DM fixed-fixed swap. The swap is pictorially depicted below. We assume that a swap bank will be needed to structure the deal. The bank will need a spread of 0.1%.



As per the conditions of the swap, the relevant cash flows will be as follows:

- i) Moon Corporation will pay interest in dollars @ 12.3% to the Swap bank and will receive interest in DM @ 6.5% from the Swap Bank.
- ii) Sun Corporation will receive interest in \$ @ 11.5% from the Swap Bank and will pay interest in DM @ 5.8% to the Swap Bank.

Cost of funds for Moon Corporation -- \$12.3%

Cost of funds for Sun Corporation -- DM5.8%

Without the swap, the costs would have been \$ 12.55 and DM 6% respectively.

Problem 7

Rajesh Ltd is a leading manufacturer of steel in India. It would like to raise 5 year debt amounting to Rs. 500 million from the capital market on floating rate basis. Rajesh Ltd is also in a position to raise funds at 5% above the 3 year fixed deposit interest of SBI due to its AAA rating. The spread demanded by the market between AAA and BBB rated companies is 2% in the fixed rate segment while it is only 1% in the floating rate segment.

Kavita Ltd is a BBB rated manufacturing firm, which wants to raise rupee funds for 5 years on fixed rate basis to finance its expansion project. It can borrow at a rate of 17%.

Both parties have approached a merchant bank for assistance in structuring a suitable swap. The merchant banker, M/S Pankaj Merchant Banking Ltd would like to take a minimum spread of 0.25% in the deal.

You are required to structure a suitable swap in which Kavitha Ltd and Rajesh Ltd will share the net benefit in the ratio of 2:1.

Solution

	<u>Rajesh Ltd</u>	<u>Kavitha Ltd</u>
Requirement	Floating Rate Rs.	Fixed Rate Rs.
Cost fixed Rs.	15%	17%
Cost floating Rs.	SBI 3 yrs FD rate+5%	SBI 3 yrs FD rate + 6%

Rajesh Ltd has an absolute advantage over Kavita Ltd in both the markets but Kavita Ltd has a comparative advantage in the floating rate market. Each can achieve cost saving by borrowing in the market where it has a comparative advantage and then doing a fixed to floating interest rate swap.

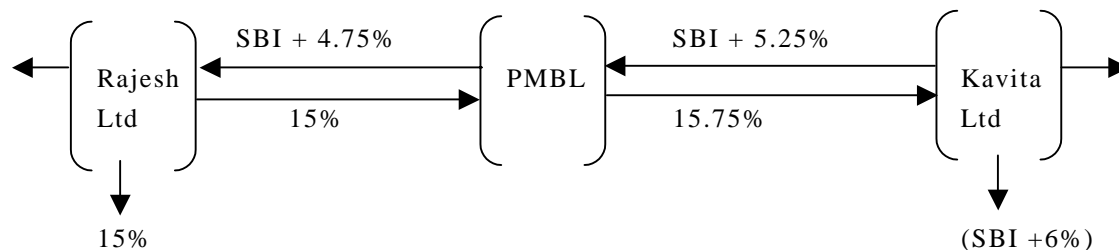
The terms of the swap arranged by Pankaj Merchant Banking Ltd could be as follows.

1. Rajesh Ltd borrows Rs. 500 million at 15%.
2. Rajesh Ltd pays Pankaj Merchant Banking Ltd (SBI 3 years FD rate + 4.75%). Pankaj MBL passes (SBI 3 years FD rate + 5.25%) to Kavita Ltd.
3. Kavita Ltd borrows Rs. 500 million at (SBI 3 years FD rate + 6%)
4. Kavita Ltd pays the PMBL at 15.75%.

$$\begin{aligned}\text{Cost to Rajesh Ltd} &> [15.00 + \text{SBI} + 4.75 - 15] \\ &= \text{SBI} + 4.75\%\end{aligned}$$

$$\text{Cost to Kavita Ltd} > [15.75 + (\text{SBI} + 6) - (\text{SBI} + 5.25)] = 16.5\%$$

$$\text{Margin to PMBL} = [15.75\% + \text{SBI} + 4.75 - 15 - \text{SBI} - 5.25] = 0.25\%$$



Problem 8

During the year 1981, World Bank was looking for fixed rate funding in US dollars to meet the requirements of its clients. Because of its credibility, World Bank was in a position to raise fixed rate funds at 9.5% p.a. payable semiannually and floating rate funds at Prime rate.

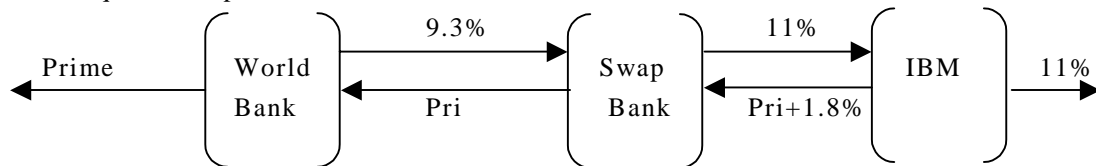
The famous Multinational, IBM was interested in raising funds on floating rate basis. Its Merchant Banker had indicated that the cost of such a loan would be 2% over the prime rate. However, it was possible for IBM to raise funds in the fixed rate bond market at 2% over 5 year treasury notes which were yielding 9% at that time.

Show how the World Bank and IBM could have reduced the cost of funds by an interest rate swap.

Solution

Requirement	Fixed Rate dollars	Floating rate dollars
Cost fixed \$	9.5%	11%
Cost floating \$	Prime	Prime + 2%

IBM had a comparative advantage in the fixed rate market though World Bank had an absolute advantage over IBM in both the markets. Both could achieve cost savings by each borrowing in the market where it had a comparative advantage and then entering into a fixed to floating rate swap. We assume that a swap bank needed to structure the swap would have quoted a spread of 0.1%.



The terms of the Swap could be as follows.

- (i) World Bank could have raised floating rate funds at Prime rate and IBM in the fixed rate market at 11%.
- (ii) The intermediary could have paid the World Bank Prime rate and in turn received from the World Bank interest @ 9.3%.
- (iii) IBM could have received 11% p.a. and paid Prime+1.8% to the Swap Bank.

$$\text{Cost of fund for World Bank} = 9.3\% + \text{Prime} - \text{Prime} = 9.3\%$$

$$\begin{aligned} \text{Cost of fund for IBM} &= \text{Prime} + 1.8\% + 11\% - 11\% \\ &= \text{Prime} + 1.8\% \end{aligned}$$

$$\begin{aligned} \text{Benefit to swap bank} &= (9.3 + \text{Prime} + 1.8) - (\text{Prime} + 11) \\ &= 0.1\% \end{aligned}$$

Problem 9

Reliance Industries is seeking a 100 year fixed rate US dollar funding. It can float a bond issue at an effective cost of 10% or raise floating rate funds at a spread of 30bp over 6 month LIBOR. Fixed to floating rate swaps are trading at LIBOR versus fixed at 20 bp over 5 year treasury bills. The yield on 5 year treasuries is 9%. Show how Reliance can reduce its funding cost via an interest rate swap.

Solution

There are two ways of raising fixed rate funding.

- I) Raise funds directly in the fixed rate market at 10%. In this case, the cost of funds would be 10%.
- II) Raise funds at a floating rate of 30bp over 6 month LIBOR and enter into a floating to fixed rate swap. In this case, the cost of funds would be $9.2 + 0.3 = 9.5\%$.

Hence, the swap route is advantageous.

Problem 10

Tata Iron and Steel Co. Ltd is a leading steel producer in India. Over the years, it has enjoyed a good Credit Rating. It is planning to set up a steel plant in the Middle East at an estimated cost of \$500 million. Out of this amount, \$100 million will be raised by borrowing. ANZ Grindlays Bank has informed TISCO that it can supply funds at a spread of 15bp over 6 month LIBOR. TISCO has also contacted ABC Ltd, a leading merchant banker, for raising funds in the Eurodollar market. ABC Ltd has informed TISCO that it will be possible to raise funds by issuing 20 year fixed rate bonds at 35bp over treasury bills which are yielding 8.20%. The CFO of TISCO feels that interest rates are going to fall in future and thus it will be beneficial for TISCO to borrow on floating rate basis. Fixed to floating rate swaps are trading at 65bp over treasuries versus LIBOR. Should the company borrow from ANZ Grindlays?

Solution

TISCO has two options to get funds on floating rate basis.

- (i) Borrow from ANZ Grindlays
- (ii) Raise funds on fixed rate basis from Eurodollar market and enter into a fixed-floating rate swap.

Option 1:

$$\text{Cost of fund} = \text{LIBOR} + 0.15$$

Option 2:

A swap is possible between a fixed rate 8.85% loan and 6 month LIBOR loan. In this case, since TISCO can raise fixed rate funds at 8.55% it should be able to arrange a swap and access floating rate funds at LIBOR - 0.30%.

Obviously, the offer made by Grindlays is not attractive.

Problem 11

An US firm ABC Inc has recently signed a MOU with the Government of India to set up a power project in Hyderabad. The company has estimated the cost of the project to be \$100 million. The company has a debt/equity ratio of 1:1. The banker of the US firm has informed that it can finance the project at a spread of 50bp over LIBOR. If the company issues debentures it can raise funds at 30bp over 5 year treasury notes which are currently yielding 8.5%. The company wants to raise funds on fixed rate basis. Meanwhile, another company DEF Inc is planning to raise funds on a floating rate basis to the tune of \$ 100 million. Given the current rating of DEF, it can raise funds either at 20bp over LIBOR or at 8.3% in the fixed rate bond market.

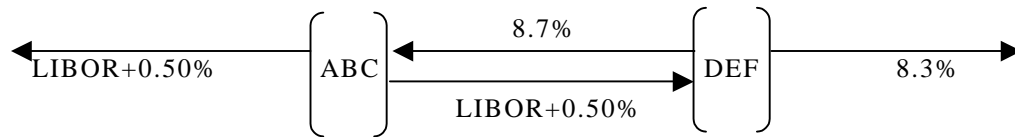
Show how a swap can be used to reduce the cost of funds for both companies.

Solution

	ABC	DEF
Requirement	Fixed rate of funding	Floating rate \$ loan
Cost of fixed \$ loan	8.8%	8.3%
Cost of floating \$ loan	LIBOR + 0.50%	LIBOR + 0.20%

ABC has comparative advantage over DEF in floating rate market though DEF has

absolute advantage over ABC in both the markets. DEF should raise funds in fixed rate market and ABC should raise funds in the floating rate bond market. They can enter into a fixed - floating rate swap structured as indicated below.



$$\begin{aligned}\text{Cost of funds for ABC} &= (\text{LIBOR} + 0.5) + 8.7 - (\text{LIBOR} + 0.5) \\ &= 8.7\%\end{aligned}$$

$$\begin{aligned}\text{Cost of funds for DEF} &= (\text{LIBOR} + 0.50 + 8.3) - 8.7 \\ &= \text{LIBOR} + 0.10\%\end{aligned}$$

Problem 12

A bank has entered into a swap with a famous corporate. Under the terms of the swap the bank will receive LIBOR on a notional principal of \$ 1000 million and pay interest at the rate of 10% per annum on the same principal. Interest is payable semiannually. The relevant discount rates for the fixed end of the swap based on the expected swap rates are as follows:

- (a) 3 month - 10.0%
- (b) 9 month - 10.5%
- (c) 15 month - 11.0%

On the last payment date, three months back, the 6 month LIBOR rate was 10%. Since then the LIBOR has not changed. What is the value of the swap to the bank if the remaining life of the swap is 15 months?

Solution

The fixed rate loan involves payment of $(.05) (1000) = \$50$ million every six months.

$$\begin{aligned}&= 50 / (1+.10)^{.25} + 50 / (1+.105)^{.75} + 1050 / (1 + .110)^{1.25} \\ &= 1016.80\end{aligned}$$

For the floating rate loan, we take LIBOR = 10% as the discount rate,
Present Value of cash inflows = $1050 / (1.1)^{.25} = 1025.28$

$$\begin{aligned}\text{Value of the swap to the bank} &= 1025.28 - 1016.80 \\ &= \$8.48 \text{ million}\end{aligned}$$

Problem 13

A bank has entered into a currency swap with a government under the following conditions.

- (a) The bank will pay 7% per annum in dollars every year.
- (b) The bank will receive 4% per annum in yens every year.
- (c) The principals involved would be \$ 10 million and Yen 1200 million.
- (d) The swap will last another 4 years.

If the currency exchange rate is Yen 120 / \$, what is the value of the swap to the bank if a discount rate of 3% for Yens and 8% for dollars is considered to be appropriate.

Solution

Interest payable is first calculated.

$$\begin{aligned}\$ \text{ loan} &: (0.07) (10) = 0.7 \text{ million} \\ \text{Yen loan} &: (0.04) (1200) = 48 \text{ million}\end{aligned}$$

Present value of payments associated with the dollar loan =

$$\begin{array}{ccccccc} & .7 & + & .7 & + & .7 & + & 10.7 \\ & \text{-----} & & \text{-----} & & \text{-----} & & \text{-----} \\ & 1.08 & & 1.08^2 & & 1.08^3 & & 1.08^4 \end{array}$$

$$= \$9.67 \text{ million}$$

Present value of payments associated with the Yen loan

$$\begin{array}{ccccccc} = & 48 & + & 48 & + & 48 & + & 48 \\ & \text{-----} & & \text{-----} & & \text{-----} & & \text{-----} \\ & 1.03 & & 1.03^2 & & 1.03^3 & & 1.03^4 \end{array}$$

$$\begin{aligned}&= \text{Yen } 1245 \text{ million} \\ &= \$ 1245 / 120 = \$ 10.37 \text{ million}\end{aligned}$$

$$\begin{aligned}\text{Present value of the swap to the bank} &= 10.37 - 9.67 \\ &= \$.70 \text{ million}\end{aligned}$$

Problem 14

City Bank has a fixed to floating rate swap on its books. As per the terms of the swap, the bank receives 12% fixed \$ semi annually and pays 6 month \$ LIBOR. The swap was entered into 15 months ago and had a maturity of 6 years. The notional principal was \$100 million. The last payment and reset date was three months ago. The LIBOR for the current semester is 12%. The current 3 month dollar LIBOR is 10% and the market for 4 years swap is quoting 12% semiannual versus LIBOR flat. Calculate the value of the swap.

Solution

Current 4 year swap rate = 10%

3 month LIBOR = 10%

1 semester LIBOR = 11%

Valuation of Floating Peg :

Present value of Floating Peg

$$= \frac{100 \times (1 + 0.06)}{(1 + 0.10 / 4)} = 103.41 \text{ million \$}$$

This is nothing but the present value of principal and interest to be paid three months from now.

Valuation of fixed Peg :

Time	Cash flow (in million dollars)
3m	6
9m	6
15m	6
21m	6
27m	6
33m	6
39m	6
45m	6
51m	6
57m	106

Present value of this cash flow by discounting at 12%

$$= \frac{1}{1.12} [6 + 6 \text{ PVIFA } (6\%, 9) + 100 \times \text{PVIF } (6\%, 9)]$$

$$(1+0.12/4) \\ = 102.91$$

$$\text{Value of the swap} = 103.41 - 102.91 \\ = \$ 0.50 \text{ million.}$$

Problem 15

La Pierre, a French consumer goods manufacturing company was having a FFr 6 million fixed rate liability. It used a swap to convert this into a \$ 1,000,000 floating rate liability. At that time the exchange rate was FF5/\$ and the fixed FFr vs 6 month dollar LIBOR swap rate was 13%. Both the fixed and floating payments are semiannual. Since then the fixed FFr interest rate has fallen. The current 3 year swap is quoting 10%. Also the FFr has appreciated to FFr 4.50/\$. The swap has 3 years and 3 months to maturity. The dollar LIBOR for the current semester was fixed 3 months ago at 12%. The current 3 month dollar LIBOR is 10%. You are required to calculate the market value of the swap.

Solution

Face Value FFr 6 million US\$1 million

Original Spot Rate FFr / \$ = 5.00

Fixed V_s 6 month LIBOR swap rate = 13%

Current Spot rate FFr / \$ = 4.50

Time of maturity - 3 year & 3 months

6 month LIBOR rate 3 months ago = 12%

3 months LIBOR rate now = 10%

Valuation of the floating Peg :

$$\text{Present Value} = \frac{1,000,000 \times (1 + 0.5 \times 0.12)}{(1 + 0.25 \times 0.10)} \\ = \$1,0146$$

Valuation of the fixed Peg :

Time	Coupon flows (FFr)
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3m	3,90,000
9m	3,90,000
15m	3,90,000
21m	3,90,000
27m	3,90,000
33m	3,90,000
39m	63,90,000

Discounted value of the cash flow stream 3 month hence

$$= 3,90,000 + 3,90,000 \text{ PVIFA } (5\%, 5) + 63,90,000 \text{ PVIF } (5\%, 6) = 68,46,273 \text{ FFr.}$$

$$= \frac{6846723}{(1+0.025)} = 6,679,730 \text{ FFr}$$

At current exchange rate of FF/\$ = 4.50

$$\text{Value of fixed Peg} = \frac{6679730}{4.50} = 1,484,384$$

$$\text{Value of swap} = 1,484,384 - 1,034,146 = \$ 450,238.$$

Problem 16

Three companies A, B and C have different borrowing objectives. The cost at which they can access funds in different markets is given below. Structure a suitable triangular swap such that the total benefit is shared equally among A, B and C.

Objective	Floating LIBOR	Floating	Prime Fixed
A Fixed	LIBOR + 1%	P + 1.5	16%
B Floating LIBOR	LIBOR + 2%	P + 0.5	15%
C Floating Prime	LIBOR + 3%	P + 1.0	14%

Solution

Each company should access funds in the market where it has a comparative advantage.

Let A access funds in the floating LIBOR market at

$$\text{LIBOR} + 1$$

Let B access funds in the floating Prime market at $P + 0.5$

Let C access funds in the fixed rate market at 14

B needs floating LIBOR funds. So it can pay A interest on the basis of LIBOR.

C needs floating prime funds. So it can pay C interest on the basis of prime rate.

A needs fixed rate funds. So it can pay C interest on a fixed rate basis.

If there were no swap, total cost of funds

$$= 16 + \text{LIBOR} + 2 + P + 1$$

$$= \text{LIBOR} + P + 19$$

With the swap the total cost of funds reduces to

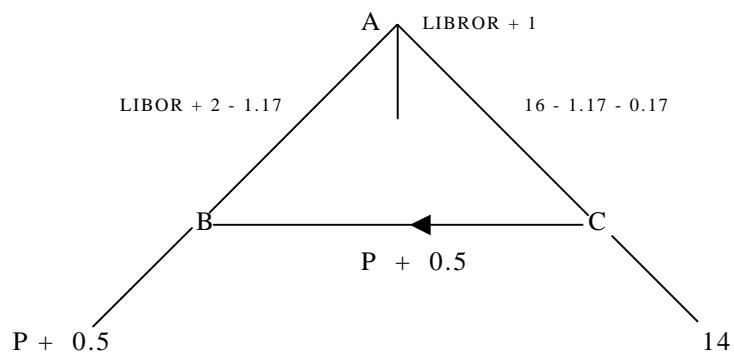
$$\text{LIBOR} + 1 + P + 0.5 + 14$$

$$= \text{LIBOR} + P + 15.5$$

$$\text{So total benefit} = (\text{LIBOR} + P + 19) - (\text{LIBOR} + P + 15.5) = 3.5\%$$

$$\text{Individual benefit} = 3.5/3 = 1.17\%$$

The swap can hence be structured as shown below.



Cost of funds after swap

$$\begin{aligned} \text{A} : & (\text{LIBOR} + 1) + (16 - 1.17 - 0.17) - (\text{LIBOR} + 2 - 1.17) = \text{LIBOR} + 1 + 14.66 - \text{LIBOR} - 0.83 \\ & = 14.83 \end{aligned}$$

$$\begin{aligned} \text{B} : & (\text{LIBOR} + 2 - 1.17) + (P + 0.5) - (P + 0.5) \\ & = \text{LIBOR} + 0.83 \end{aligned}$$

$$\text{C} : (P + 0.5) + (14) - (16 - 1.17 - 0.17)$$

$$= P - 0.16$$

Problem 17

A, a leading bank would like to avail of a floating LIBOR denominated dollar loan. B, a manufacturing company prefers to access fixed rate dollar funds. C, a financial institution based in USA would like to avail of a floating prime rate denominated dollar loan. The cost of accessing funds in each market is indicated below.

	Fixed	Floating LIBOR	Floating Prime
A	14%	LIBOR + 0.5%	P + 0.5%
B	13%	LIBOR + 0.3%	P + 0.75%
C	12%	LIBOR + 0.4%	P + 1.0%

Explain how a swap can be structured if the total benefit is to be shared equally among the three parties.

Solution

Let A access funds in the floating prime market

Let B access funds in the floating LIBOR market

Let C access funds in the fixed rate market

Total cost of funds as a result of swap

$$= P + 0.5 + \text{LIBOR} + 0.3 + 12$$

$$= P + \text{LIBOR} + 12.8$$

Total cost of funds without swap

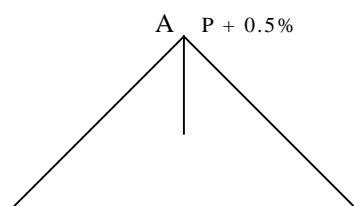
$$= \text{LIBOR} + 0.5 + 13 + P + 1.0$$

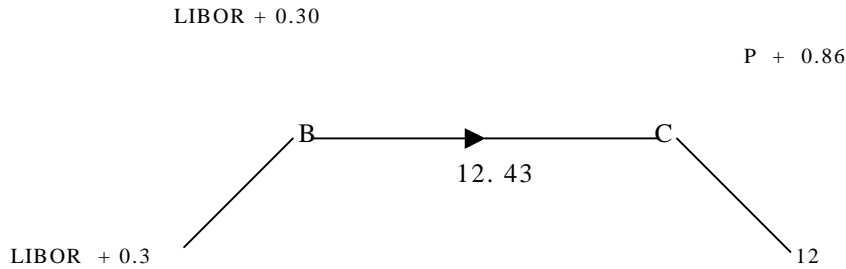
$$= \text{LIBOR} + p + 14.5$$

$$\text{Total benefit} = -(P + \text{LIBOR} + 12.8) + (\text{LIBOR} + P + 14.5) = 1.7\%$$

$$\text{Benefit to each party} = 1.7 / 3 = 0.57\%$$

The swap can be structured as follows :





Cost of funds for each party is computed below :

$$A : (P + 0.5) + (\text{LIBOR} + 0.30) - (P + 0.86) = \text{LIBOR} - 0.06$$

$$B : (\text{LIBOR} + 0.3) + (12.43) - (\text{LIBOR} + 0.3) = 12.43\%$$

$$C : (P + 0.86) + (12) - (12.43) = P + 0.43\%$$

Problem 18

Three parties A, B, C need to borrow in different currencies. The cost of accessing funds in various currencies and the borrowing objectives are given below. The funds will be needed for a period of 12 months.

	A	B	C
Objective	\$ Fixed	DM Fixed	Yen Fixed
\$ Cost(%)	6.5	7.0	6.0
DM Cost(%)	3.0	3.5	4.0
Yen Cost(%)	2.0	1.0	1.5

The spot rates prevailing are DM 1.8/\$ and Yen 120/\$. Explain how a three way currency swap can be used to lower the cost of funding. Assume that the total benefit from the swap is shared equally among the parties concerned.

Solution

A currency swap involves exchange of both interest and principal. Further, the loan amounts have to synchronise roughly with the exchange rates prevailing.

Suppose A wants to borrow \$1 million

B wants to borrow DM 1.8 million

C wants to borrow Yen 120 million

Without a swap, the total cost of funding would be :-

$$6.5 + 3.5 + 1.5 = 11.5\%$$

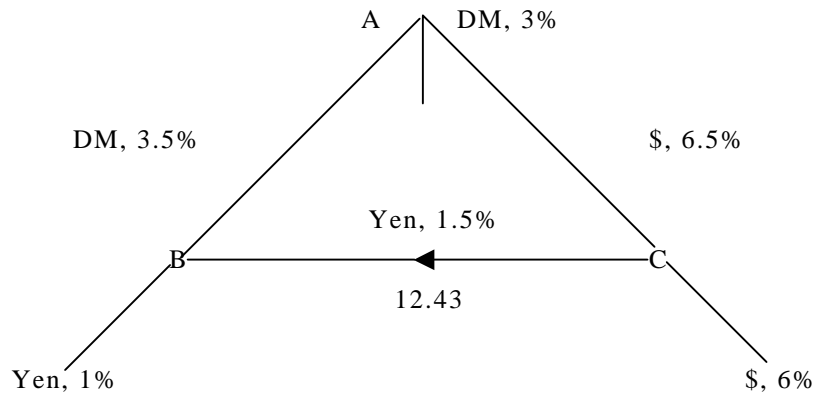
Suppose A borrows DM, B borrows Yen and C borrows \$ based on the competitive advantage they enjoy in their respective markets. The total cost of funding reduces to

$$6.0 + 3.0 + 1.0 = 10\%$$

The net benefit as a result of the swap = $11.5 - 10 = 1.5\%$

This means that each party can benefit by 0.5%

The swap can be structured as follows :



A borrows DM 1.8 million @ 3% from the market and lends to B.

At the end of the swap, A receives DM 1.8 million and interest @3.5% from B.

B borrows Yen 120 million @1% from the market and lends to C.

At the end of the swap B receives Yen 120 million and interest @1.5% from C.

C borrows \$1.0 million at 6% from the market and lends to A.

At the end of the swap, C receives \$1.0 million and interest @6.5% from A.

We assume that interest is paid at the end of the tenure of the loan and that exchange rates move in line with interest parity. We also assume that the lowest cost of funds closely

approximates LIBOR. Using interest parity we can now work out the forward rates.

One year DM/\$ forward rate

$$= (1.8) \frac{(1 + 0.03)}{(1 + 0.06)} = \text{DM } 1.7491 / \$$$

One year Yen/\$ forward rate

$$= (120) \frac{(1 + 0.01)}{(1 + 0.06)} = \text{Yen } 114.34 / \$$$

One year Yen/DM forward rate

$$= \frac{114.34}{1.7491} = \text{Yen } 65.37 / \text{DM}$$

Cost of funds to each party at the end of the swap can be worked out as follows:

$$\begin{aligned} \text{A : } & \text{DM } (1.8) (1.03) - \text{DM } (1.8) (1.035) + \$ (1) (1.065) \\ & = -\text{DM } 0.009 + \$ 1.065 \\ & = -\$ (0.009) / 1.7491 + \$ 1.065 \\ & = \$1.059855 \text{ million} \\ & = \$1,059,855 \end{aligned}$$

$$\begin{aligned} \text{B : } & \text{Yen } (120) (1.01) - \text{Yen } (120) (1.015) + \text{DM } (1.8) (1.035) \\ & = -\text{Yen } 0.6 + \text{DM } 1.863 \\ & = -\text{DM } 0.6/65.37 + \text{DM } 1.863 \\ & = \text{DM } 1.853822 \text{ million} \\ & = \text{DM } 1,853,822 \end{aligned}$$

$$\begin{aligned} \text{C : } & \$ (1.0) (1.06) - \$ 91.0) (1.065) + \text{Yen } (120) (1.015) \\ & = -\$ 0.005 + \text{Yen } 121.8 \\ & = -\text{Yen } (0.005) (114.34) + \text{Yen } 121.8 \\ & = \text{Yen } 121.2283 \text{ million} \\ & = \text{Yen } 121,228,300 \end{aligned}$$

The benefits arising from the swap are tabulated below :

	Outflow without swap	Outflow with swap	Benefit
A	\$ 1,065,000	\$ 1,059,855	\$ 5,145
B	DM 1,863,000	DM 1,853,822	DM 9,178
C	Yen 121,800,000	Yen 121,228,300	Yen 571,700

Problem 19

Three companies A, B, C have the following borrowing objectives.

A : Fixed rate SF
B : Fixed rate Yen
C : Fixed rate DM

Cost of accessing funds in each market for A, B, C is given below.

	A	B	C
SF	2.00	2.50	3.00
Yen	1.00	1.25	1.50
DM	3.50	4.50	5.50

Explain how a three way currency swap can be structured. Assume that the funds will be used for a year and the spot rates are DM 1.20 / SF and Yen 80 / SF.

Solution

In this problem, A has the lowest borrowing cost in all the markets and C the highest borrowing cost in all the currencies. However, a possibility for structuring a swap arises due to comparative advantage rather than an absolute advantage. Quite clearly A has a comparative advantage in the DM market while it needs funding in a different currency, ie SF.

Similarly B has a comparative advantage vis a vis C in the SF market.

C has a comparative advantage in the Yen market.

Assume the principal amount involved for A is SF 1 million. Then B can borrow approximately Yen 80 million and C DM 1.20 million.

Without swap, the total cost of funding

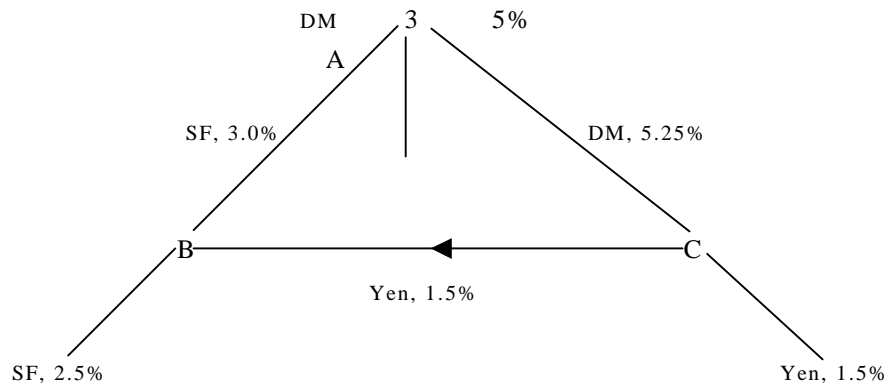
$$= 2.00 + 1.25 + 5.50 = 8.75$$

With swap, the total cost of funding

$$= 3.50 + 2.50 + 1.50 = 7.50$$

So the total benefit due to the swap is 1.25%

Let us assume that A by virtue of its relatively high credit rating wants a share of 0.75% while B and C are each happy with a benefit of 0.25%. The swap can then be structured as indicated below. For simplicity's sake, let us assume that the spot rates remain same after a year.



A borrows DM 1.20 million @ 3.5% and transfers to C
A receives DM 1.20 million along with interest @ 5.25% from C
B borrows SF 1 million @ 2.5% and transfers to A
B receives SF 1 million along with interest @ 3.0% from A

C borrows Yen 80 million @ 1.50% and transfers to B
C receives Yen 80 million along with interest @ 1.50% from B

Then; net cash flows for A, B, C can be calculated as follows :

$$\begin{aligned}
 A &: \text{DM } (1.2) (1.035) - \text{DM } (1.20) (1.0525) + \text{SF } (1) (1.03) \\
 &= - \text{DM } 0.021 + \text{SF } (1.03) \\
 &= - \text{SF } 0.021 / 1.2 + \text{SF } (1.03) \\
 &= \text{SF } 1.0125 \text{ million}
 \end{aligned}$$

$$\begin{aligned}
 B &: \text{SF } (1.0) (1.025) - \text{SF } (1) (1.03) + \text{Yen } (80) (1.015) \\
 &= - \text{Yen } (0.005) (80) + \text{Yen } (81.20) \\
 &= \text{Yen } 80.8 \text{ million}
 \end{aligned}$$

$$C : \text{Yen } (80) (1.015) - \text{Yen } (80) (1.015) + \text{DM } (1.2) (1.0525) = \text{DM } 1.263 \text{ million}$$

The benefit due to the swap can be tabulated below :

Cash outflow without Swap	Cash outflow with Swap	Net Benefit

A	SF 1.02 million	SF 1.0125 million	SF 7,500
B	Yen 81 million	Yen 80.8 million	Yen 200,000
C	DM 1.266 million	DM 1.263 million	DM 3,000