Determination of Currency Rates

Direct & Indirect Quotes

1 $ = 60 Rs — Direct

1 Re = 1/60 $ — Indirect

- When the number of units of home currency to deal in one unit of foreign currency is given it is Direct quote

1 £ = 1.5 $

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REFERENCE RATE ARCHIVE

SEARCH REFERENCE RATE

Select the Option: ☑ All ☐ GBP ☐ YEN ☐ USD ☐ EURO

From Date: 01/11/2017 To date: 05/11/2017 GO

Download to: Excel

Date	USD	GBP	EURO	YEN
03/11/2017	64.5764	84.4272	75.3348	56.6600
02/11/2017	64.5930	85.7860	75.2831	56.7200
01/11/2017	64.5256	85.6706	75.0755	56.7000

- Direct Quote: In this case there is one unit of foreign currency and corresponding units of home currency. Example of direct quotes in India
  - 1$ = Rs.40 1£ = Rs.82 1€ = Rs.54

- Indirect quote: In this case there is one unit of home currency and corresponding units of foreign currency. Examples of indirect quotes in India
  - Re1 = $0.0250 Re.1 = £0.0122 Re.1 = €0.0185

- International Quotes (also known as cross currency quotes) – in this case both the currencies are foreign currencies. Examples of international quotes in India
  - 1$ = £0.5488 1€ = $1.2000

1 $ = Bid 40.10 / Ask 40.25

↳ Spread

- Bank/financial institution/dealer will always quote two rates in a foreign exchange quote.
  - The first rate of quote (known as bid) – in the rate at which the proposer of the rate buys the currency
  - The second rate of the quote (known as ask) – is the rate at which the proposer sells the currency.

- The difference between the two rates is called as spread and is the profit of the proposer.

Question

- Calculate how many rupees a New Delhi based Indian firm will receive or pay for its following currency transactions:
  - The firm receives dividend amounting to Euro 112000 from its French associate company
  - The firm pays interest amounting to 200000 yens for its borrowing from a Japanese bank
  - The firm exported goods to USA and just received USD 300000
  - The firm has imported goods from Singapore amounting to Singapore Dollars (SGD) 400000
  - Given:
    - 1$ = Rs.40.00/40.05
    - 1€ = Rs.56.00/56.04
    - 1SGD = Rs.24.98/25.00
    - 100¥ = Rs.44.00/44.10

Bid Ask

Proposed by the bank

Answer

- (i) Foreign exchange rate 1€ = Rs.56/56.04
  - The firm shall be selling €; the bank shall be buying € @ Rs.56.
  - The firm will receive 1,12,000 * 56 = Rs.62,72,000

- (ii) foreign exchange rate 1¥=Re0.4400/0.4410
  - The firm shall be buying the yens; the bank shall be selling the yens @ 0.4410
  - The firm will pay ¥2,00,000 * 0.4410 i.e. Rs.88,200

- (iii) foreign exchange rate 1$=Rs.40/40.05
  - The firm shall be selling $; the bank shall be buying $ @ Rs.40
  - The firm will receive $3,00,000 * 40 = Rs.1,20,00,000

- (iv) foreign exchange rate 1SGD = Rs.24.98/25
  - The firm shall be buying SGD; the bank shall be selling the SGD
  - The firm will pay 4,00,000SGD x 25 i.e. Rs.1,00,00,000

Question

- Calculate how many British pounds a London based firm will receive or pay for its following four foreign currency transactions
  - The firm receives dividend amounting to Euro 120000 from its French associate company
  - The firm pays interest amounting to 200000 yens for its borrowing from a Japanese bank.
  - The firm exported goods to USA and has just received USD 300000
  - The firm has imported goods from Singapore amounting to SGD 400000
  - Given
    - 1$ = £0.50/0.51
    - 1€ = £0.60/0.61
    - 1SGD = £0.60/0.61
    - 1¥ = £0.0049/0.0050

Answer

- (i) Foreign exchange rate 1€ = £0.60/0.61
  - The firm shall be selling €; the bank shall be buying € @ £0.60
  - The firm will receive 1,12,000 * 0.60 = £72,000

- (ii) foreign exchange rate 1¥= £0.0049/0.0050
  - The firm shall be buying the yens; the bank shall be selling the yens @ £0.0050
  - The firm will pay ¥2,00,000 * 0.0050 i.e. £1000

- (iii) foreign exchange rate 1$= £0.50/0.51
  - The firm shall be selling $; the bank shall be buying $ @ £0.50
  - The firm will receive $3,00,000 * 0.50= £1,50,000

- (iv) foreign exchange rate 1SGD = £0.39/0.40
  - The firm shall be buying SGD; the bank shall be selling the SGD
  - The firm will pay 4,00,000SGD x 0.4000 i.e. £1,60,000

Question

- Calculate how many rupees a Delhi based firm will receive or pay for its following four currency transactions
  - The firm receives a dividend to Euro90,000 from its French associate company
  - The firm pays interest amounting to 200000 yens for its borrowing from a Japanese bank
  - The firm exported goods to USA and has just received USD 300000
  - The firm imported goods from Singapore amount to SGD 400000
    - Given
      - 1Re = Euro 0.0178/0.0180
      - 1Re = Yens2.50/2.51
      - 1Re = $0.0249/0.0250
      - 1Re = SGD0.040/0.041

Answer

- (i) Foreign exchange rate 1re = €0.0178/0/0180
  - The firm shall be selling €; the bank shall be selling the rupees @ Rs0.0180
  - The firm will receive 90000/0/1080 = Rs.50,00,000

- (ii) foreign exchange rate 1Re = ¥=2.50/2.51
  - The firm shall be buying the yens; the bank buying the rupee @ Yen2.50
  - The firm will pay ¥2,00,000/2.50 i.e. Rs.80,000

- (iii) foreign exchange rate 1Re = $0.0249/0.0250
  - The firm shall be selling $; the bank shall be selling the rupees @ 0.0250
  - The firm will receive $3,00,000/0.0250 = Rs.1,20,00,000

- (iv) foreign exchange rate 1Re = SGD0.040/0.041
  - The firm shall be buying SGD; the bank shall be buying the rupees /selling the SGD @ 0.040
  - The firm will pay 4,00,000SGD /0.040 i.e. Rs.1,00,00,000

Question

- Calculate how many USD a New York based firm will receive or pay for its following four currency transactions
  - The firm receives dividend amounting to Euro 120000 from its French associate company
  - The firm pays interest amounting to 270000 yens for its borrowing from a Japanese bank.
  - The firm exported goods to UK and has just received pound 300000
  - The firm has imported goods from Singapore amounting to SGD400000
    - Given
      - 1$ = Euro 0.7937/0.80000
      - 1$ = Yens 135/136
      - 1$ = Pound 1.99/2.000
      - 1$ = SGD1.60/1.61

1Euro = $1/0.8000 – 1$/0.7937
1Yen = $1/136 - $1/135
1Pound = $1/2.00 - $1/1.99
1SGD = $1/1.61 - $1/1.60

Answer

- (i) Foreign exchange rate 1€ = $1/0.8000 – 1$/0.7937
  - The firm shall be selling €; the bank shall be buying € @ 1/0.80
  - The firm will receive 1,20,000 * 1/0.80 = $1,50,000

- (ii) foreign exchange rate 1¥= 1Yen = $1/136 - $1/135
  - The firm shall be buying the yens; the bank shall be selling the yens @ 1/135
  - The firm will pay ¥2,70,000 * 1/135 i.e. $2000

- (iii) foreign exchange rate 1Pound = $1/2.00 - $1/1.99
  - The firm shall be selling Pound; the bank shall be buying pounds @ 1/2.00
  - The firm will receive 3,00,000 * 1/2.00= 3,00,000

- (iv) foreign exchange rate 1SGD = $1/1.61 - $1/1.60
  - The firm shall be buying SGD; the bank shall be selling the SGD @ 1/1.60
  - The firm will pay 4,00,000SGD x 1/1.60 i.e. 2,50,000

Spot and Forward rates

- Purchase and sale of one currency against other currency may be either on spot basis for future delivery.

- In spot transaction, the currencies are delivered immediately (the same day) or within two days from the date of transaction the exchange rate of spot transaction is called as “Spot Rate”.

- A future deliver transaction is one in which a contract is made between two parties for purchase and sale of one currency against other at a stipulated future date at a rate agreed upon at the time of the contract. In such contracts, delivers of currencies are made on the stipulated future date. The exchange rate of a future delivery transaction is called as “forward rate”.

Example

- Spot 1$ = Rs.39.95/39.97
- 1 month forward 1$ = Rs.39.98/40.00

- A person agreed to buy $10000 on one month forward (on the basis of above quotes) from x bank.

- Under the contract as above, he will pay Rs.4,00,000 and bank will provide him $10000 and both the currencies to be delivered after one month

Forward margin (premium or discount)

- The forward rate for a currency may be costlier or cheaper than its spot.

- The difference between the forward and spot rate is known as forward margin or swap points.

- If a currency is costlier in future as compared to spot, it is said at premium and viceversa

Example

- Example 1
  - Spot: 1$ = Rs.40
  - Six month forward: 1$ = Rs.42
    - Dollar is at premium; rupee is at discount
- Example 2
  - Spot: 1$ = Rs.40
  - Six month forward: 1$ = Rs.39.65
    - Dollar is at discount; rupee is at premium
- Example 3
  - Spot Re.1 = $0.0250
  - Six month forward Re 1 = $0.0240
    - Rupee is at discount; dollar is at premium

- For quantifying premium/discount of a currency or foreing currency, we should
  - Find forward price of that currency
  - Find spot price of that currency
  - And then apply the following formula

  - % change in price of currency =

$$\frac{forward\ price\ of\ currency - spot\ price\ of\ currency}{spot\ price\ of\ currency} \text{ x } 100$$

Example

- Spot 1$ = Rs.40; forward 1$=Rs.44. Find
  - Premium of dollar
  - Discount of rupee

- % premium of $ = [(44 – 40)/40] x 100 = 10%

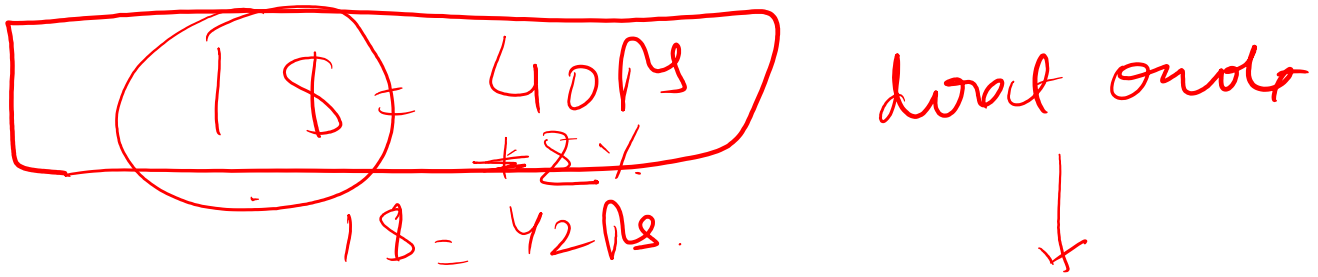
- % discount of rupee: for this purpose we have to calculate price of rupee which is as follows:
  - Spot 1Re = 1/40 → $0.0250
  - Forward Re.1 = 1/44 → 0.022727272
  - Therefore Discount of Re. = [(0.022727272 – 0.0250)/0.0250] * 100 = 9.09%

Example

- Spot 1$ = Rs.40; forward 1$=Rs.42. Find
  - Premium of dollar
  - Discount of rupee

- % premium of $ = [(42 – 40)/40] x 100 = 5%

- % discount of rupee: for this purpose we have to calculate price of rupee which is as follows:
  - Spot 1Re = 1/40 → $0.0250
  - Forward Re.1 = 1/42 → 0.0238095238
  - Therefore Discount of Re. = [(0.0238095238 – 0.0250)/0.0250] * 100 = 4.76%



- Forward rates are quoted at premium or discount in relation to the spot rates. The rule for adding or subtracting discount/ premium are as follows
  - If left hand currency is at premium, the amount of premium is added to the right hand currency.
  - If left hand currency is at discount, the amount of discount is substracted from the right hand currency.

- There are two possibilities regarding discount/premium
  - Which currency is at premium/discount – this may be given or this can be interpreted
  - Amount of forward margin i.e. swap points given. If forward margin is in ascending order, it represents premium of left hand currency; if it is in descending order, it represents discount of left hand currency

Example

- A person has to pay $13750 after three months from today. Spot rate: Re.1 = $0.0275. rupee is likely to depreciate by 5% over three months. What is the likely forward rate?

- As rate of dollar are given against rupee i.e. rupee is the left hand currency, amount of discount should be deducted from right hand currency for estimating the forward rate.

- Hence forward rate is
  - Re.1 = $0.0275 - $0.0275(5/100) = 0.026125

Example

- Spot 1$ = Rs.40.00/40.10
- 1 month forward = 0.10/0.11
- 2 month forward = 0.12/0.13
- 3 month forward = 0.14/0.15

40.10 / 40.21
40.12 / 40.23
40.14 / 40.25

- Calculate 1 month, 2 months and 3 months forward rates.
  - 1 month forward rate = Rs.40.10/40.21
  - 2 months forward rate = Rs.40.12/40.23
  - 3 months forward rate = Rs.40.14/40.25

Example

- Spot 1$ = Rs.40.10/40.20
- 1 month forward = 0.10/0.09
- 2 month forward = 0.15/0.14
- 3 month forward = 0.20/0.18

- Calculate 1 month, 2 months and 3 months forward rates.
  - 1 month forward rate = Rs.40.00/40.11
  - 2 months forward rate = Rs.39.95/40.06
  - 3 months forward rate = Rs.39.90/40.02

Question

a. Calculate 2 months, 3 months, and 4 months forward rate
b. What amount you will pay in rupees for purchasing 5,00,000 USD
c. How many dollars you will sell to get Rs.5,00,000
d. Calculate % of discount/premium on 3 months, 4 months forward rates. Assume
   - (i) you are buying $
   - (ii) you are selling $

- Following information is given:
  - You are given the following $ quotes
    - Spot 1$ = Rs.40.50/40.60
    - 2 months forward 0.10/0.20
    - 3 months forward 0.20/0.10
    - 4 months forward 0.25/0.30

Solution

- Solution (a)
  - Spot 1$ = Rs.40.50/40.60
  - 2 month forward = 40.60/40.80
  - 3 month forward = 40.30/40.50
  - 4 month forward = 40.75/40.90

- Solution (b)
  - We are purchasing dollars therefore proposer is selling dollar and therefore ask is applicable.
  - For 5,00,000 USD spot we have to pay Rs.2,03,00,000 (500000 * 40.60)

- Solution (c)
  - We are selling dollars and buying rupees, proposer is buying dollars and therefore bid is applicable i.e.40.50
  - Total number of dollars to get Rs.5,00,00 = 500000/40.50 i.e. $12345.70

- Solution (d)
  - You are buying $
    - Spot rate = 1$ = Rs.40.50/40.60
    - 3 month Forward rate = 1$ = Rs.40.30/40.50
    - Therefore % discount (3 months) = [(40.50 – 40.60)/40.60]* 100 = 0.2463%
  - You are selling $
    - Spot rate = 1$ = Rs.40.50/40.60
    - 3 month Forward rate = 1$ = Rs.40.30/40.50
    - Therefore % discount (3 months) = [(40.30 – 40.50)/40.50]* 100 = 0.4938%

- Solution (d)
  - You are buying $
    - Spot rate = 1$ = Rs.40.50/40.60
    - 4 month Forward rate = 1$ = Rs.40.75/40.90
    - Therefore % discount (4 months) = [(40.90 – 40.60)/40.60]* 100 = 0.7389%
  - You are selling $
    - Spot rate = 1$ = Rs.40.50/40.60
    - 3 month Forward rate = 1$ = Rs.40.75/40.90
    - Therefore % discount (4 months) = [(40.75 – 40.50)/40.50]* 100 = 0.6173%

Calculate how many rupees a New Delhi based firm will receive or pay for its following foreign currency transactions:

(a) Purchasing $1,00,000 on 2 months forward basis

(b) Selling 70000 Canadian Dollars (CD) on 3 months forward basis

(c) Purchasing 8,25,000 Japanese Yens on 1 month forward basis

	Spot	1 month forward	2 month forward	3 month forward
1$	Rs.40.00/40.10	5/6 paise	11/10 paise	10/11 paise
1CD	Rs.34.90/35.00	0.10/0.20	0.11/0.12	0.10/0.11
100 yens	Rs.33.00/33.10	0.11/0.10	0.12/0.13	0.14/0.15

Answer

- (a) In two months forward market, the $ is at discount – the discount is in paisa while the rate of $ is in rupees. Converting the discount in rupees we get 11/100 – 10/100 i.e. 0.011/0.10. Hence, two month forward rate 1$ = 39.9890/40.00.
  - Therefore for purchasing $1,00,000 the new Delhi based firm has to pay Rs.1,00,000 x 40 i.e. 40,00,000 Rs.

- (b) in three months Canadian dollar is at premium. Therefore three months forward rate 1CD = 35/35.11.
  - Therefore the new Delhi based firm against 70000 CD will receive 70000 x 35 i.e. Rs.24,50,000

- (c) in one month Japanese yen is at discount. Therefore 1 month forward rate for yen is 100 yens = 32.89/33.
  - New Delhi based firm will pay 8,25,000 * 33/100 = Rs.2,72,250

The following foreign currency rates, per pound are being quoted in London Markets

	Spot	3 month forward	4 month forward
USD	1.6200/1.6220	0.30/0.40c	0.40/0.30c
CD	1.9000/1.9010	0.40/0.50c	0.50/0.40c
Japanese yen	200/205	½	2/1

How many pounds a person will pay for purchasing
(i) 1,00,000 USD on spot;
(ii) 1,00,000CD on 3 months forward and
(iii)1,00,000 Japanese yens on 4 month forward

answer

- (i) 1£ = $1.6200/1.6220
  - Bank is purchasing £ therefore bid is applicable and hence the customer to buy 1,00,000 USD has to pay 1,00,000/1.6200 = £61728.40
- (ii) 1 £ = 1.9040/1.9060
  - Bank is buying £ therefore bid is applicable and hence the customer has to pay 1,00,000/1.9040 = £52,521
- (iii) 1 £ = 198/199 yens
  - Bank is buying £ therefore bid is applicable and hence the customer has to pay 1,00,000/198 = £ 505.05

Question

- A French firm exported certain cosmetic goods to a New York firm, the invoice being $4,00,000, credit terms 30 days. Spot exchange rate 1$ = 0.80€. Find the gain/loss to the exporter if € strengthens by 5% over the 30 days period. What if € weakens by 5% during the period. Make calculations in term of € per $. Attempt the question by (a) direct quote (b) indirect quote.

Answer (a)

- If Euro strengthens by 5% - Euro Premium 1/20 and $ discount is 1/21
  - 1$ = 0.80euro – (1/21)(0.80 euro) = .761904 euro
  - Statement showing gain/loss if euro strengthens by 5%
  - Euro receivables on the date of export 4,00,000 * .80 = 3,20,000
  - Actual receipt 4,00,000 * .761904 = 3,04,762
    - Loss = 15238 Euro

- IF euro weakens by 5% - euro discount 1/20 and $ premium 1/19
  - 1$ = 0.80euro + (1/19)(0.80 euro) = .842105 euro
  - Statement showing gain/loss if euro weakens by 5%
  - Euro receivables on the date of export 4,00,000 * .80 = 3,20,000
  - Actual receipt 4,00,000 * .842105 = 3,36,842
    - Loss = 16842 Euro

Answer (b)

- Spot rate: 1 Euro = 1/0.80 $ = $.125
- If Euro strengthens by 5%
  - 1€ = 1.25(1.05) = $1.3125
  - Statement showing gain/loss if euro strengthens by 5%
  - Euro receivables on the date of export 4,00,000 * .80 = 3,20,000
  - Actual receipt 4,00,000 /1.3125 = 3,04,762
    - Loss = 15238 Euro

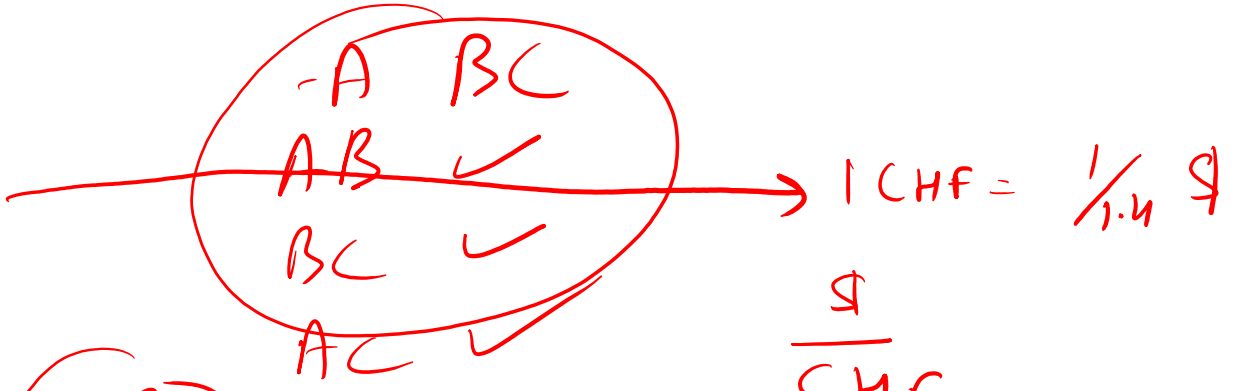
- IF euro weakens by 5% - euro discount 1/20 and $ premium 1/19
  - 1€ = 1.25(0.95) = $1.1875
  - Statement showing gain/loss if euro weakens by 5%
  - Euro receivables on the date of export 4,00,000 * .80 = 3,20,000
  - Actual receipt 4,00,000 / 1.1875 = 3,36,842
    - Loss = 16842 Euro

Cross Rates

- In a given market, suppose exchange rates for currencies rupees and US dollars and for currencies rupees and pounds imply an exchange rate, called ‘cross rate’ between currencies US dollars and UK pounds.

Example

- Let A, B and C be three currencies. We are given exchange rates between A & B and between B & C. we can derive the rate between A & C. the rates so derived are known as cross currency rates.
- Example
  - 1$ = Rs.40
  - 1$ = CHF 1.40
  - 1CHF = Rs.????
- Therefore
- $\frac{Rs.}{CHF} = \frac{Rs.}{\$} \times \frac{\$}{CHF}$ i.e. 40 x 0.71429 = Rs.28.5714
- 1 CHF = Rs.28.5714



Question

- Rs./£: 74.00/74.50; Rs./CHF: 26.00/26.60; Find CHF/£

- 1£ = 74/74.50Rs.
- 1Re = 0.013423/0.01351
- 1CHF = 26/26.60Rs.
- 1Re = 0.03759/0.03846CHF
- 1£ = CHF????
  - Bid = CHF/Re * Re/£ i.e. 0.03759*74 = 2.7817
  - Ask = CHF/Re * Re/£ i.e. 0.03846 * 74.50 = 2.8653
- CHF/£ = 2.7817/2.8653

Question

- An Indian firm is interested in purchasing 5m Chinese yuan. The following quotations have been given by two different banks:
  - Bank A:
    - 1£ = Rs.79.89/80.00
    - 1£ = CY12.50/12.60
  - Bank B:
    - 1CY = $0.1598/0.1600
    - 1$ = Rs.40/40.05

- Advise the Indian firm

Answer

- Two alternatives
- (a) 5 million can be purchased for 5000000/12.50 = 400000£ and sell 400000£ for Rs.80 i.e. total Rs.3,20,00,000
- (b) against 5 million CY we get 5000000 * 0.1600 $ i.e. 800000 and this amount can be purchased for 800000 x 40.05 = Rs.3,20,40,000
- First alternative is recommended

Question

- Given the following rates, find bid and ask rates for CY in terms of rupees
- 1$ = 5.7040/5.7090CY
- 1$ = 40.30/40.50 Rs.
- 1CY = Rs.????

- Answer
  - Rs./CY = Rs./$ * $/CY
  - Bid = 40.30 * 1/5.7090 = 7.0590
  - Ask = 40.50 * 1/5.7040 = 7.1003

Question

- An exporter customer requests a bank to sell 25,00,000 SGD. The interbank market rates are as follows
  - Mumbai $1 = Rs.45.85/45.90
  - London £1 = $1.7840/1.7850
  - London £1 = SGD3.1575/3.1590
- The bank wishes to retain an exchange margin of 0.125%. (calculate rate in multiples of .0001). How many rupees the exporter will receive

Answer

- 1SGD = Rs.?????

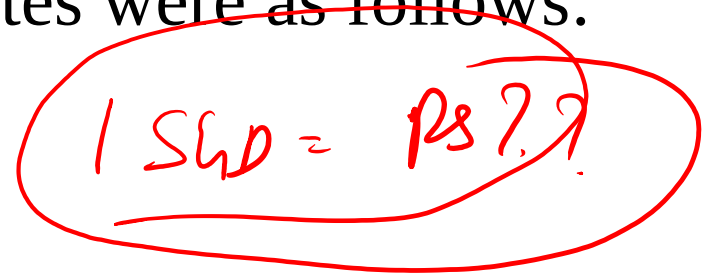
- Rs./SGD = Rs./$ * $/£ * £/SGD

  Bid = 45.85 * 1.7840 * 1/3.1590 = 25.8931

  Ask = 45.90 * 1.7850 * 1/3.1575 = 25.9482
- 1SGD = 25.8931/25.9482
- Therefore 25.8931 - .125% = 25.8607 * 25,00,000 = 6,46,51,750Rs.

Question

- An importer customer requested a bank to remit 25,00,000 SGD to the supplier. The interbank market rates were as follows:
  - Mumbai $1 = Rs.45.91/45.97
  - London £1 = $1.7765/1.7775
  - London £1 = SGD3.1380/3.1390



- The bank wishes to retain an exchange margin of 0.125%. (calculate rate in multiples of 0.0001). How many rupees the importer will pay?

Answer

- 1SGD = Rs.?????

- Rs./SGD = Rs./$ * $/£ * £/SGD

  Bid = 45.91 * 1.7765 * 1/3.1390 = 25.9825

  Ask = 45.97 * 1.7775 * 1/3.1380 = 26.0394

- 1SGD = 25.9825/26.0394
- Therefore 26.0394 +.125% = 26.07194925 * 25,00,000 = 6,51,79,873Rs.

Question

- XYZ bank, Amsterdam, wants to purchase Rs.25 million against £ for funding their Nostro account and they have credit LORO account with bank of London, London. Calculate the amount of £'s credited.
- Ongoing inter bank rates are
  - $:Rs. = 61.3625/3700
  - £:$ = 1.5260/70

Answer

- £ = Rs.????
- Rs./ £ = Rs./$ * $/ £
- = 61.3625 * 1.5260 = 93.639175 (Bid)
- = 61.3700 * 1.5270 = 93.71199 (Ask)

- £ = 93.639175/93.71199

- 25 million Rupees = 25million/93.71199 = 2,66,774.83 £

Risk in Foreign Exchange

- Generally there is a time gap between an international business/ finance activity and purchase/sale of foreign exchange in connection with that activity.

- Of late, the exchange rates have become volatile and therefore there is always an element of risk on account of adverse movement of exchanger rates.

- Foreign exchange risk is defined as the possibility of adverse movement in foreign exchange rates.

- For example, an Indian firm exports goods when one US dollar is equal to Rs.61, by the time it receives the payment, one US dollar may be equal to Rs.60. the result is that the Indian firm will receive lesser amount in term of Rupees.

- Another example, an Indian firm enters into a contract of import when US $ is equal to Rs.60. by the time it has to pay, the rate may be Rs.61 i.e. the Indian firm has to pay more amount of rupees.

- Similarly, an Indian firm borrowed in US$ when one US$ was equal to Rs.60, it has to repay, when one US$ is equal to Rs.61, the Indian firm has to pay more amount as principal amount as compared to what it received.

- The movement in exchange rate is not always adverse; sometimes there may be favorable movements in foreign exchange rates resulting in profits. Profits are welcome but the treasurers cannot ignore the possibility of adverse movement in exchange rates because such movements result in loss and no one like losses.

To summarize

- Foreign exchange risk is defined as the possibility of adverse movement in foreign exchange rates
- If one has to sell the foreign currency in future, the possibility of decline in the rate/price of that currency is foreign exchange risk
- If one has to buy some foreign currency, the possibility of increase in the rate/price of that currency is foreign exchange rate risk
- To conclude: foreign exchange rat risk refers to such movement ins foreign exchange rat which result in loss/profit

- Foreign exchange risk management is the process through which the treasurers try to reduce/eliminate the loss that may result from an adverse movement of foreign exchange rates. There are five important techniques of foreign exchange risk management

  - Forward contracts
  - Futures
  - Options
  - Currency swaps
  - Money market operations

Forward contracts

- Forward exchange contracts is a contract wherein out of two parties (in India, one party compulsorily being a bank) one agrees to deliver a certain amount of foreign exchange at an agreed rate at a fixed future date to the other party.

Exchange control requirements

- Forward contract facility is available if the party is exposed to genuine risk on account of exchange rate movement (As per RBI announcement date 7th April 2014 resident individual can book forward contracts without production of underlying documents up to an annual limit of US $2,50,000)

- Contracts for forward purchase or sale of foreign currency can be entered into only in permitted currency.

- Exporters and importers in India can book forwards contracts only with those banks which are authorized to deal in foreign exchanges (ADs)

- The banks can undertake inter-bank transactions for conversion of one foreign currency against another with a bank in India or in the overseas market for covering the customer/operational requirements.

Elements of forward contracts

- Contract amount: forward exchange contracts have to be for definite amounts. The amount of the forward contracts is expressed in foreign currency and equivalent rupee (rounded off)

- Parties to the contract: there are always two parties in the forward contract. Two parties in the forward contract can be two banks, a merchant customer and a bank, a bank in India an overseas bank.

- Rate: rate of exchange at which the sale/purchase of foreign exchange is to be made should be mentioned.

Currency of cover

- In trade transactions forward contract can be booked only on the basis of specific order/ letter of credit/ sale contract.

- The currency of contract should be the currency in which the cash flow accrues and the amount should not exceed the amount of cash flows.

- However, the customer has a choice to a book a forward contract for a part or whole amount of underlying order.

Question

- On 1.1.2005, UBS a French firm, purchased a machinery from a US firm for $1,00,000 on 3 months credit. On the same day, the French firm entered into a 3 months forward contract with its bank for purchasing $1,00,000. Later on the machinery was found sub-standard. After negotiation, it was decided that UBS will pay only $70,000. On 31.3.2005, UBS book the delivery of $70,000 from the bank and paid the same to the US firm. Calculate the net amount in Euro that UBS has to pay to its bank, using the following data
- 1.1.2005
  - Spot - 1€ = $1.25/1.26
  - 3 month forward swap margins - 0.10/0.08c
  - 31.3.2005 spot - 1€ = $1.26/1.27

Answer

- 1.1.2005 spot 1€=$1.25/1.26
  3 month forward 1€=$1.2490/1.2592
- 31.3.2005 3 month spot 1€=$1.26/1.27

- 3 month forward buy 100000 USD on 1.1.2005 = 1,00,000/1.2490= 80064€
- On 31.3.2005 sell 30000$ @ 1.27 = 30000/1.27 = 23622€
- Therefore
  - Amount payable = 80064 €
  - Amount receivable = 23622 €
  - Net payable to the bank = 56442 €

Question

- A US company exports a radiotherapy machine to the health department of government of Switzerland. The price is 1,00,000CHF with terms of 30 days. The present spot rate is 1.72 CHF per dollar. The 30 days forward rate is 1.71. The US company enters into forward contract. How many dollars the US co. would receive after 30 days? Is the CHF at premium or at discount.
- Answer
  - 1$ = 1.72CHF spot & 1$ = 1.71CHF one month forward
  - US firm will receive 1,00,000/1.71 = 58479.53$
- Purchasing power of dollar is decreasing i.e. dollar is at discount and CHF is at premium

Question

- JKL ltd. An Indian company has an export exposure of JPY10,00,000 payable august 31, 2014. Japanese Yen is not directly quoted against Indian rupee
- The currency spot rates are
  - INR/$ = Rs.62.22 JPY/$ = 102.34
- It is estimated that Japanese yen will depreciate to 124 level and Indian rupee to depreciate against $ to Rs.65.
- Forward rates for august 2014 are
  - INR/$ = Rs.66.50 JPY/$ = 110.35
- Required
  a. Calculate the expected loss, if the hedging is not done. How the position will change, if the firm takes forward cover?
  b. If the spot rates on August 2014 are INR/$ = Rs.66.25 and JPY/$ = 110.85. Is the decision to take forward cover justified.

Answer

Answer to Question A

Receivable on the date of export (A)	10000000*(62.22/102.34)	Rs.60,79,734
Expected receivable on the date of maturity (without hedging) B	10000000*(65/124)	Rs.52,41,935
Receivable on the date of maturity (with hedging) C	10000000* (66.50/110.35)	Rs.60,26,280

Expected loss without hedging (A – B)	Rs.8,37,799
Loss with hedging (A – C)	Rs.53,454

Hedging will reduce the loss substantially

Answer to Question B

Receivable on the date of export (X)	10000000*(62.22/102.34)	Rs.60,79,734
Actual receipt on the date of maturity (Y)	10000000*(66.25/110.85)	Rs.59,76,545
Loss	10000000* (66.50/110.35)	Rs.1,03,189

Forward is justified as it will result in reduced amount of loss

Question

- A US firm imports some technology worth 100000 SGD, payment terms 1/2 net 45 days. The spot rate for SGD is 0.55$. The 45 days forward rate is 0.56$. Compute
  - Cost in $ if payment is made within 2 days
  - Cost in $, using forwards, if payment is made on 45th days
  - Explain the reasons of difference between (a) and (b)

- (a) if payment made now = 100000 * 0.55 = $55,000 – 1% = 54,450$
- (b) if payment is done after 45 days = 100000 * 0.56 = 56,000$
- (c) total difference 56,000 – 54,450 = 1550
  - Difference on account of early payment = 1000*.56 = 560
  - Difference on account of foreign exchange fluctuation = 99,000 * 0.01 = $990

Question – Exposure netting

- A British firm will have following major cash transactions during 2 months:
  1. Cash payment to creditors due in 1 month £1,20,000
  2. Cash receipts from foreign customer due in 1 month $1,78,500
  3. Purchase of machinery, cash payment due in 2 months $5,00,000
  4. Dividend income, cash receipt due in 2 months $1,00,000
- Data
  - Spot 1£ = $1.5000/1.5050
  - 1 month forward = 0.0060/0.0050
  - 2 month forward = 10/11 cents

- The firm uses forwards to hedge against foreign exchange risk. Calculate the net sterling pounds receipt and payments that the firm might expect for both its 1 month and 2 months transactions

Answer

- Spot 1£=$1.5000/1.5050 and one month forward 1£=1.4940/1.5000
  - Cash payment £1,20,000
  - Cash receipt $1,78,500 (will be converted into £)
    - i.e. 1,78,500/1.5000 = $1,19,000
  - Net payment after 1 month = $1,000

- Spot 1£=$1.5000/1.5050 and one month forward 1£=1.6000/1.6150
  - Cash payment $5,00,000
  - Cash receipt i.e. dividend income = $1,00,000
    - i.e. 4,00,000/1.6000 = £2,50,000
  - Net payment after 2 months = £2,50,000

Question

- Alert ltd. is planning to import a multipurpose machine from Japan at a cost of 3400 lakhs yen. The company can avail of loans at 18% interest per annum with quarterly rests with which it can import the machine. However, there is an offer from Tokyo branch of an Indian based bank extending credit of 180 days at 2% per annum against opening an irrevocable letter of credit.
- Other information
  - Present exchange rate Rs.100 = 340 yen
  - 180 days forward rate Rs.100 = 345 yen
  - Commission charges for the letter of credit at 2% per 12 months. Advise whether the offer from the foreign branch should be accepted?

- Credit from Tokyo branch is available for 180 days. Considering this fact, we assume
  - Alert Ltd. requires credit for 180 days i.e. under both the alternatives, all the payments (principal, commission & interest) will be made after 180 days.
  - 180 days = 6 months = 2 quarters

- Alternative A
  - To pay 3400 lakh yen, company may borrow 1000 lakhs in Indian market. From this amount, it may purchase 3400 lakhs yen and pay for machine. (now there is no foreign exchange risk). It may repay the loan (raised in Indian market) with interest after 180 days. Total payment (including interest) = Rs.1000 lakhs (1.045)(1.045) = Rs.1093.45 lakhs.

- Alternative B
  - Company may borrow 3400 lakhs yen from Tokyo branch and pay for the machine. It has to pay 34 lakhs yen as interest (rate of interest 2% p.a. for 180 days it is 1% and 1% of 3400 lakhs yen = 34 lakhs). The company has to pay 3434 lakhs yen after 180 days. At that time 1 yen can be purchased, on the basis of forward, for Re.0.289855 (345 yens = 100 Rs.)(1yen=100/345 i.e. 0.289855)
  - Total payment by the company 3434 lakhs * .289855 i.e. Rs.995.362 lakhs to the Tokyo Branch
  - Under this alternative, cost of getting Letter of credit will be paid. Bank charges for issuing LC is 1% (commission is 2% for 12 months). The LC will be for 3400 lakhs yen which is equal to Rs.1000 lakhs. Hence commission = 1000 lakhs * 1% i.e. Rs.10 lakhs, which will also be paid after 180 days and bank will charge interest @18% on this commission also. Therefore total payment for commission is 10 lakhs (1.045)(1.045) = Rs.10.92 lakhs

Summary

Total payment under alternative I (after 180 days)	Rs.1092.025 lakhs
Total payment under alternative II (after 180 days) Rs.995.362 – Tokyo Branch Rs.10.92 – Indian bank for LC	Rs.1006.282 lakhs
Recommendation: Alternative II (borrow from Tokyo Branch may be preferred)	

Question

- Gibraltar ltd. Has imported 5000 bottles of shampoo at landed cost in Mumbai of $20 each. The company has the choice for paying for the goods immediately or in 3 months time. It has a clean overdraft limit where 14% p.a. rate of interest is charged.
- Calculate which of the following method would be cheaper to Gibraltar limited.
  - (i) pay in 3 months time with interest @ 10% and cover risk forward for 3 months
  - (ii) settle now at current spot rate and pay interest of the overdraft for 3 months
- The rates are as follows:
  - Mumbai Rs./$ spot 60.25/60.55
  - 3 month swap 35/25

- 3 months forward rate : 1$ = Rs.59.90/Rs.60.30

- (i) cash outflow after 3 months = 1,02,500 @ 60.30 = Rs.61,80,750
- (ii) cash outflow after 3 months = 1,00,000 * 60.55 * (1.035) = Rs.62,66,925

- The First alternative (pay the exporter in three months time) is recommended

- Excel exporters are holding an export bill in USD 100,000 due 60 days hence. They are worried about the falling USD value which is currently at Rs.45.60 per USD. The concerned export consignment has been priced on an exchange rate of Rs.45.50 per USD. The firms bankers have quoted a 60 day forward rate of Rs.45.20. calculate
  - (i) rate of discount quoted by the bank
  - (ii) The probable loss of operating profit if the forward sale is agreed to.

- $\%\ discount\ of\ \$\ for\ 60\ days$
  - $= \frac{forward\ rate - spot\ rate}{spot\ rate} \times 100$
  - $= \frac{45.20 - 45.60}{45.60} X\ 100 = 0.8772$

- Annualized discount rate = 0.8772 x (365/60) = 5.3363%
- Loss of operating profit (if on forward basis)
- = Re 0.30 per $ on 1,00,000$ i.e. Rs.30,000

Question

- A company is considering hedging its foreign exchange risk. It has made a purchase on 1st January, 2008 for which it has to make a payment of $50,000 on September 30, 2008. the present exchange rate per Dollar is Rs.40. It can purchase forward $ at Rs.39. the company will have to make a upfront premium @2% of the forward amount purchased. The cost of funds to the company is 10% per annum and the rate of corporate tax is 50%. Ignore taxation. Consider the following situations and compute the profit/loss the company will make if it hedges its foreign exchange risk.
  - (i) if the exchange rate on 30th September, 2008 is Rs. 42 Per$
  - (ii) if the exchange rate on September 30, 2008 is Rs.38 per $mm

Profit / loss in Rupees on account of hedge if rate on maturity is Rs.42/$

Cost without Hedge (A)	$ 50,000 @ Rs. 42	Rs.21,00,000
Comparable cost with Hedging		
(i) Premium	$1,000	Rs.40,000
(ii) Cost of funds on premium	Rs.40,000 * 0.10 * (9/12)	Rs,3,000
(iii)Payment on maturity	$50,000 @ Rs.39	Rs.19,50,000
(i) Total (B)		Rs.19,93,000
Profit on Account of Hedge		Rs.1,07,000

Profit / loss in Rupees on account of hedge if rate on maturity is Rs.38/$

Cost without Hedge (A)	**$ 50,000 @ Rs. 38**	**Rs.19,00,000**
Comparable cost with Hedging		
(i) Premium	$1,000	Rs.40,000
(ii) Cost of funds on premium	Rs.40,000 * 0.10 * (9/12)	Rs,3,000
(iii)Payment on maturity	$50,000 @ Rs.39	Rs.19,50,000
(i) Total (B)		Rs.19,93,000
Profit on Account of Hedge	Rs.93,000	

Reversal (Cancellation) of forward contract

- In the absence of any instruction from the customer, contracts which have matured are automatically cancelled on the fifteenth day from the date of maturity. (in case of holiday next working day)

- Exchange loss if any is recovered from the customer under advice to him. The customer is not paid any gains out of such cancellation.

- Forward contract can also be cancelled at the request of the customer. In such a case, the bank recovers/pays, as the case may be, the difference between the contract rate and the rate at which the cancellation is effected. However, no gain is paid to the customer if the contract is cancelled at the request of customer after the date of maturity.

Reversal (Cancellation) summarized

Type of cancellation	Action by Bank	Gain /loss on cancellation
Cancellation before maturity at customers request	The bank enters into an opposite forward contract with the customer, if under original contract the bank was to sell a currency to customer, the bank will purchase that currency, on forward basis, from the customer and vice versa. The new contract will have same maturity date as that of old contract (which is to be cancelled)	• Gain will be paid by the bank to the customer • Loss will be recovered from the customer
Cancellation on maturity at customers request	The bank does opposite action on spot basis i.e. if under original contract the bank was to sell a currency to customer, the bank will purchase that currency from the customer on spot basis and vice versa	- Do -
Cancellation after maturity at customers request (Upto 14th day after the date of maturity	- Do -	Loss will be recovered from the customer. Gain wont be given to the customer
Cancellation by the bank on 15th day after the date of maturity	- Do -	- Do -

Question

- A customer with whom the bank had entered into 2 months forward purchase contract for € 5000 @ Rs.54.50 comes to bank after 1 month and requests for cancellation of the contract. On this date, the prevailing rates are:
  - Spot 1€ = Rs.54.50/54.70
  - One month forward 1€ = Rs.54.90/55.04
- What is the loss or gain to customer on cancellation
- Answer
  - on the day the customer comes to the bank for cancellation the bank will enter into a forward contract (same maturity date as that of the original) under which the bank will sell €5000 @ 55.04 (Rs.2,75,200)
  - On maturity bank will sell €5000 to customer @55.04 and purchase 5000€ @ 54.50 from the customer (Rs.2,72,500).
  - Loss to the customer Rs.2,700. (this loss will be recovered from the customer)

Question

- SBI has booked a forward purchase contract for USD1,00,000 due 14th March, 2003 @ Rs.48.25. On maturity, the customer fails to deliver the dollars and requests for cancellation of the contract. Spot rate on 14th March, 2003: $=Rs.48.6525/48.7325. what amount of gain/loss will be payable to/ receivable from customer?

- Answer
  - On 14th March the bank will sell $1,00,000 on spot (@48.7325 per $) for Rs.48,73,250, the bank will purchase 1,00,000$ (@Rs.48.25 per $) for Rs.48,25,000 under the original (forward) contract. Loss to the customer Rs.48,250. this loss will be recovered from the customer

Question

- Bank of India has booked a forward sale contract for USD 1,00,000 @ Rs.48.42 due on 10th March 2003. the customer did not contact the bank on due date. However, on March 14, 2003, the customer requests the bank to cancel the contract. On this date, spot rate is Rs.48.5000/Rs.48.5700. what amount of gain/loss will be payable to/ receivable from the customer

- Answer
  - On 14th March, the bank will sell 1,00,000$ on under the original (forward) contract @ Rs.48.42 per $ for Rs.48,42,000; the bank will purchase 1,00,000$ @ Rs.48.50 for Rs.48,50,000 on spot. Gain to the customer Rs.8000. this gain won’t be given to the customer, it will be retained by the bank.

Question

- A bank had booked a forward sale contract for $1,00,000 due 10th March 2003 @ Rs.48.42. The customer did not contact the bank on/before/after the date of maturity. Given the following spot rates, what amount of gain/loss will be payable to/receivable from customer
  - 24th march, 2003 (Monday) 48.49/48.57
  - 25th march, 2003 48.50/48.58
  - 26th March, 2003 48.51/48.59
- Answer
  - On 25th March, the bank will sell 1,00,000$ under the original forward contract @ Rs.48.42 per $ for Rs.48,42,000; the bank will purchase 1,00,000$ @Rs.48.50 per $ for Rs.48,50,000 on spot. Gain to the customer Rs.8,000. this gain won’t be given to the customer, it will be retained by the bank.

Question

- A bank enters into a forward purchase TT covering an export bill for Swiss Francs 1,00,000 at Rs32.4000 due on 25th April and covered itself for same delivery in the local inter bank market at Rs.32.42000. However, on 25th March, exporter sought for cancellation of the contract as the tenor of the bill is changed
- In Singapore market, swiss francs were quoted against US dollars as under
  - Spot — USD 1 = Swiss Francs — 1.5076/1.5120
  - One month forward — 1.5150/1.5160
  - Two months forward — 1.5250/1.5270
  - Three months forward — 1.5415/1.5445
- And in the interbank market US dollars were quoted as under
  - Spot — USD 1 = Rupees — 49.4302/.4455
  - Spot/April — .4100/.4200
  - Spot/ May — .4300/.4400
  - Spot/ June — .4500/.4600
- Calculate the cancellation charges payable by the customer if exchange margin required by the bank is 0.10% on buying and selling

Answer

- For cancellation of the contract, the bank will be selling swiss francs (customer will be buying swiss francs) one month forward at the prevailing rates
  - 1USD = SF1.5150/1.5160 SF/USD
  - 1SF = 1/1.5160 – 1/1.5150 USD/SF
  - 1USD = Rs.49.4100/49.4200 Rs./USD

  - Rs./SF = Rs/USD * USD/SF
    = 49.4200 * 1/1.5150
    = 32.6205
- Bank will sell swiss francs to customer at Rs.32.6205 + 0.10% i.e. Rs.32.6531
- Loss to the customer = 1,00,000 * (32.40 – 32.6531) = Rs.25,250

Extension of forward contract

- Extension is permissible, at the customers request, on or before maturity. The bank takes two steps

  i. cancels the original contract i.e. the bank will take all the steps required for cancellation of the contract on or before the date of maturity.

  ii. the bank will enter into a new forward contract maturing on the date requested by the customer. The FEDAI guidelines summarize this situation as: “cancel & Rebook”. The amount of loss/gain is received from/paid to customer at the time when the customer approaches the bank for extension

Question

- On 15th July, PNB booked a forward sale contract for USD 2,50,000 due August 30 @ Rs48.35. on 10th August the customer request the bank to extend the forward contract for 30th September. Foreign exchange rates on 10th August are:

  - Spot 48.1325 – 48.1675
  - Forward 30th August 47.6625 – 47.7175
  - Forward 30th September 47.4425 – 47.5375

- At what rate the contract will be extended? What amount of loss/gain will be receivable from/ payable to customer

Answer

- On 10th August, the bank will enter into two forward contracts with the customer. Under the first contract, the bank will buy 2,50,000$ from the customer on30th August @ 47.6625 (this contract is necessary for cancellation of 15th July contract) under second contract, bank will sell 2,50,000$ to the customer on 30th September @ 47.5375 (this contract is necessary as the customer wants 2,50,000 $ on this date on forward basis
- On 30th August
  - The bank will sell 2,50,000$ to customer (under 15th July contract) for 2,50,000 * 48.35 = Rs.1,20,87,500
  - The bank will purchase 2,50,000$ from customer for 2,50,000 * 47.6625 = Rs.1,19,15,625 (under the first contract entered on 10th August)
  - Loss to the customer is Rs.1,71,875. this loss will be recovered from the customer on 10th August itself.
- On 30th September
  - The bank will sell 2,50,000$ to the customer @ Rs.47.5375
  - (under the second contract entered on 10th August

Question

- An importer requests his bank to extend the forward contract for 20,000$ which is due for maturity on 30th October, 2010 for a further period of 3 months. He agrees to pay the required margin money for such extension of the contract.
- Contracted rate 1$ = Rs.42.32
- The US dollar quoted on 30-10-2010
  - Spot 41.5000/41.5200
  - 3 months premium 0.87%/0.93%
- Margin money for buying and selling is 0.075% and 0.20% respectively.
- Compute
  i. The cost to the importer in respect of the extension of the forward contract, and
  ii. The rate of new forward contract

Answer

- Assuming all the rates given in the question are inter bank rates i.e. without adjustment of margin
- (i)
  - the bank will sell 20000$ @ Rs.42.32
  - The bank will purchase 20000$ spot @ Rs.41.50 minus margin i.e. 41.50 * 0.075% i.e. 41.4689 (say 41.47)
  - Cost to the importer (at the time of extension) = 20000 (42.32 – 41.47 = Rs.17000
- (ii)
  - The bank will enter into a forward contract maturity (3 months) under which the bank will sell 20000$ @ 41.52 plus premium @ 0.93% plus margin @ 0.20% i.e. 41.99
  - Rate for new forward contract = Rs.41.99/$

Early delivery

- The steps of early delivery can be divided into 3 parts
  - Take delivery on spot basis and make provisional payment on the original forward contract rate basis
  - A fresh contract for the cancellation of the original contract
  - On maturity

Take delivery on spot basis and make provisional payment on the original forward contract rate basis

- The net effect of these two steps is that there will be either debit or credit balance in the customer’s account.

- This will be settled at the same time of maturity of the original contract (i.e. at the time of final settlement) along with interest.

- If there is credit balance in the customer’s account the bank will pay interest at the rate of fixed deposit interest rate; if there is debit balance the bank will charge the customer interest at the rate of its prime lending rate (PLR)

A fresh contract for the cancellation of the original contract

- The bank enters into an opposite forward contract with the customer, under the original contract the bank was to purchase the foreign currency from the customer, the bank will sell that currency on forward basis to the customer.

- The new contract will have same maturity date as that of old contract (which is to be cancelled)

On maturity

- The bank will execute both the forward contracts (original contract as well as the contract entered on the date of early delivery).

- Under the original contract the bank will purchase the foreign currency and under the new contract (entered on the date of early delivery) the bank will sell the foreign currency.

- The customer’s account will be settled with interest.

Question

- You are working for a bank. On 1st May, your bank entered into a forward contract with a customer for purchased of USD1,00,000 delivery 31st July; contract rate Rs.48. On 1st June, the customer approached the bank with delivery of USD1,00,000 which were delivered against the forward contract. On this date, the rates were as follows:

  - Spot Rs.49.2825 (locked in rate)
  - Forward (July 31) Rs.49.8025 – 49.8875

- The banks prime lending rate is 13%. It accepts deposits for 2 months @ 4.50% p.a. what amount of loss/gain will be receivable from payable to customer.

Answer

- The bank will take 3 steps on 1st June
  i. It will purchase 1,00,000$ from customer on spot @ Rs.49.2825

  ii. It will pay the customer Rs.48,00,000 (on the basis of rate of 1st May contract)

  The net effect of these two steps [step (i) and step(ii)] is that there will be credit balance of Rs.1,28,250 in the customer's account. This will be paid by the bank to the customer at the time of maturity of the original contract (i.e. at the time of final settlement) along with interest @ 4.50% p.a. for two months (i.e. 1st June to 31st July)

  iii. Bank will enter into a new contract with customer under which it will sell 1,00,000$ to customer on forward basis (maturity 31st July) @ Rs.49.8875 (this contract is necessary for cancellation of 1st May contract.)

- 31st July
  i. On 31st July, the bank will sell 1,00,000$ @49.8875 (under new contract entered on 1st June) and will purchase 1,00,000$ from the customer @48 (under 1st May contract)
  ii. Interest will be credited to the customer's account @ Rs.1,28,250 for two months (1st June to 31st July) @ 4.50 p.a.
  iii. The customer's account will be settled. The customer will pay Rs.59,538; details as follows

Customer's Foreign currency dealing account			
Current Account	48,00,000	FC	49,28,250
FC	49,88,750	Interest	962
		FC	48,00,000
		Current Account	59,538

Rupee roll over forward contract

- There are situations like foreign currency loan being repaid in installments over a number of years or imports being made on deferred payment terms, and the amount is to be paid on different dates.
- The duration of such payments may be long.
- Therefore, exchange risk is involved.
- Forward contracts for dates falling after six months are practically not available.
- In such situation, roll over forward contracts are used to cover the exchange risk.

- Roll over forward contract is one where forward contract is initially boked for the total amount of loan etc. to be repaid
- As and when instalment falls due, the same is paid by the customer in foreign currency at the exchange rate fixed in forward exchange contract.
- The balance amount of the contract is rolled over (extended) till the due date of next instalment.
- The process of extension continues till the loan amount has been repaid

Cross currency forward contract

- A forward contract in which two foreign currencies are involved is known as cross currency forward contract.

- For example, a contract by an Indian firm to purchase certain amount of Dinar at the rate 1 Dinar = 4 USD, one month after the contract, is a cross currency forward contract.

- When these type of contracts are rolled over, they are known as cross currency roll over contracts.

Question

- A person gets an interest free loan of USD 3,00,000. repayment is to be done in three equal half yearly instalments
- Assume the following rates
  - A – Today : Six months forward rate 42/42.50
  - B – at the end of six months : spot 43/43.10
    six months forward : 43.40/43.50
  - C – at the end of one year : spot 44/44.10
    six months forward : 44.50/44.60
  - D – at the end of 1½ year : spot 45/45.10
- Find the amount he has to pay in rupees in following three cases. Give your recommendations:
  i. No hedging
  ii. Rupee roll over forward
  iii. Three separate forward contracts, one today, one after six months and one after one year from today (ignore bank commission)

Answer

i. 43,10,000; 44,10,000; 45,10,000

ii. Foreign Exchange rate

Today – spot rate neither given nor required

6 months forward rate: 1$ = Rs.42/42.50

After six months from today

spot rate 1$ = Rs.43/43.10

6 months forward rate: 1$ = Rs.43.40/43.50

After one year from today

spot rate 1$ = Rs.44/44.10

6 months forward rate: 1$ = Rs.44.50/44.60

After 18 months from today

spot rate 1$ = Rs.45/45.10

a) Today: enter into a forward contract to purchase 3,00,000$ after six months from today @ Rs.42.50

b) After six months from today
   i. Purchase 3,00,000$ @Rs42.50, use, 1,00,000$ to repay the loan, sell remaining 2,00,000$ to bank on spot basis @Rs.43. enter into a six months forward contract to purchase 2,00,000@ Rs.43.50
   ii. Net payment to bank = [-(3,00,000 * 42.50) + (2,00,000 * 43)] = Rs.41,50,000

c) After 1 year from today
   i. Purchase 2,00,000$ @Rs43.50, use, 1,00,000$ to repay the loan, sell remaining 1,00,000$ to bank on spot basis @Rs.44. enter into a six months forward contract to purchase 1,00,000@ Rs.44.60
   ii. Net payment to bank = [-(2,00,000 * 43.50) + (1,00,000 * 44)] = Rs.43,00,000

d) After 18 months from today
   i. Purchase $1,00,000 @ Rs.44.60 and use for repayment

(iii) 42,50,000; 43,50,000; 44,60,000

Statement showing payment in rupees in under each of three alternatives

	I Alternative	II Alternative	III Alternative
After 6 months from today	43,10,000	41,50,000	42,50,000
After 12 months from today	44,10,000	43,00,000	43,50,000
After 18 months from today	45,10,000	44,60,000	44,60,000

II alternative is recommended

Question

- An Indian construction firm has constructed a bridge in a foreign country. It will receive the payment of $1,00,000 after 1½ years from today. The following foreign exchange rates are available
- Assume the following rates
  - A – Spot : 1$ = Rs.46/46.05
    Six months forward rate : 1$ = Rs.45.95/46.00
  - B – after six months from today
    Spot : 1$ = Rs.45.85/45.90
    six months forward : 1$ = Rs.45.80/45.85
  - C – after one year from today
    spot : 1$ = Rs.45.70/45.75
    six months forward : 1$ = Rs.45.50/45.55
  - D – after 1½ year from today
    spot : 1$ = Rs.45.40/45.45
- Find the present value of what you receive under Roll over forward contract if cost of capital is 10% compounded half yearly

a) Today: enter into a forward contracts to sell 1,00,000 after six months from today @ Rs.45.95

b) After six months from today: get the contract cancelled
   i. Purchase $1,00,000 on spot basis @Rs45.90 and Sell $1,00,000 under the original forward contract @Rs.45.95
   ii. Net cash in flow Rs.5000
   iii. Enter into a six months forward contract to sell 1,00,000$ @ Rs.45.80

c) After 1 year from today. Get the contract cancelled
   i. Purchase $1,00,000 on spot basis @Rs45.75 and Sell $1,00,000 under the original forward contract @Rs.45.80
   ii. Net cash in flow Rs.5000
   iii. Enter into a six months forward contract to sell 1,00,000$ @ Rs.45.50

d) After 18 months from today

   Sell $1,00,000 @ Rs.45.50. net cash inflow : Rs.45,50,000

P.V. of receipts $5000/(1/1.05) + 5000\ (1/1.05)^2 + 45,50,000(1/1.05)^3$ = Rs.39,39,758

Future Contracts

- A currency future contract is a contract to buy or sell on the exchange a standard quantity of foreign currency at a future date at the price agreed to between the parties to the contract.

- These are standardized contracts that are traded on organized future markets

- In most of the cases, these contracts are cash settled and not delivery settled.

International currency exchanges

- In these exchanges, futures contracts are trade for three maturity dates:
  - (i) last working day of current calendar quarter
  - (ii) last working day of next calendar quarter. And
  - (iii) last working day of next to next calendar quarter

- Example: suppose we are interested in entering a futures contract on 24th May 2014; we enter into the contract maturing on last working day of June, last working day of September or last working day of December

- Currency futures contracts are available for the British Pound, Canadian Dollar, Swiss Frank, US Dollar, Japanese Yen, Australian Dollar and European currency unit.

- Contract sizes are standardized according to amount of foreign currency – for example, C$ 1,000,000; CHF 125,000

- In India, currency futures are available in four currencies
  - USD, Pound, Euros and Yens
- The maturity date is the last working day of the month.
- 12 maturities contracts are traded at a time
- The market lot is 1000 USD, 1000 pounds, 1000 Euros and 100000 yens
- Currency futures are traded on BSE, NSE and MCX stock exchange

- The organization of futures trading, on currency exchanges, reduces the default risks of trading as after the deal is finalized, two contracts notes are prepared
  - (i) between the buyer and the exchange and
  - (ii) between the seller and exchange

- Actually, the exchange takes upon itself to fulfil both the sides of the contract.

- This reduces the default risk in the market, as everybody is dealing with the exchange which is not likely to go bankrupt very easily.

- Mark to market is one of the important features of the futures contract.
- Under this feature, the prices of the future contracts are marked to the market on daily basis.
- After the future contract has been entered into, on the evening of each working day, profit/loss of each party is calculated on the basis of closing price of futures contract.
- The party which as suffered loss has to make good the loss and the party which has gained will receive the amount.
- Daily settlement reduces the default risk of futures contracts relative to forward contract.

- Five features of futures
  - Exchange traded
  - Standard size
  - Standard maturity dates
  - Mark to the market
  - Contract with the exchange

Difference between forward and future contracts

1. Regulation: the forward market is self regulating. Future markets are regulated by future exchange
2. Size of contract: forward contracts are individually tailored and tend to be much largen than the standardized contracts on the futures market. Futures contracts are standardized in terms of currency amount.
3. Delivery dates: banks offer forward contracts for delivery on any date. Futures contracts are available for delivery only on specified dates.
4. Settlement: forward contract settlement occurs on the date agreed upon between the bank and its customer. Future contract settlement is made daily via the exchanges, clearing house; gains on position values may be withdrawn and losses are collected daily. The practice is known as mark to market
5. Quotes: forward prices generally are in direct quote. Future contracts are generally quoted in indirect quotes.

Mark to market

- Mark to market is one of the important features of the futures contracts.
- Under this feature, the prices of the future contracts are marked to market on daily basis.
- After the futures contract has been entered into, on the evening of each working day, profit/loss of each party is calculated on the basis of closing price of the futures contract.
- The party which has suffered loss has to make good the loss and the party which has gained will receive the amount

Question

- On Monday Harry enters into a future contract of purchasing 1,25,000 swiss francs (SF) at the rate of 1SF = $0.750. this contract is to mature on Thursday. At the close of trading on Monday, Tuesday and Wednesday, the future prices are 0.755, 0.745 and 0.795. at the close of trading on Thursday, the spot rate in $0.805. what amount the investor receives/pays on different days? Explain the outcome of the contract explaining the theoretical concepts of the different steps.

- on Monday, at the close of trading, the Thursday maturing future prices were $0.755. harry has gained on account of price fluctuation as the price of what he has purchased has gone up. He will receive the gain i.e. 1,25,000 * 0.005 i.e. Rs.625

- *The important point is that the basis of mark to market on the first day of the futures contract transaction is the price at which the contract is entered into and the futures price of that contract prevailing in the market of that day*

- in fact, on Monday evening three steps will be taken:
  - Harry receives a gain of Rs.625
  - The original future contracts will be cancelled
  - A new futures contracts will be entered into. Under the new future contract harry will be required to buy 125000SFs @ 0.755$

- At the close of trading on Tuesday, the Thursday maturing futures prices were $0.745. harry has suffered loss on account of price fluctuation as the contract that was entered into on Monday evening required him to purchase at the rate of $0.755, but the price has gone down to 0.745. he will pay the loss i.e. 1,25,000 * 0.10 i.e. $1250

- In fact on Tuesday evening three steps will be taken
  - Harry pays a loss of $1250
  - The futures contract entered on Monday evening will be canceled
  - A new futures contract will be entered into. Under the new futures contract harry will be required to buy 125000SF @ 0.745$

- At the close of trading on Wednesday, the futures prices were $0.795. on Tuesday harry pays $1250 and on Wednesday he receives $6250 under the mark to market system
- At the close of trading on Wednesday, the Thursday maturing futures prices were $0.795. harry receives $6250 under the mark to market system
- In fact on Wednesday evening three steps will be taken
  - Harry receives a gain of $6250
  - The futures contract entered on Tuesday evening will be cancelled
  - A new futures contract will be entered into. Under the new futures contract harry will be required to buy 125000SFs @ 0.795$

- *The important point is that the basis of mark to market on the Tuesdays and Wednesdays is (i) closing price of futures on that day and (ii) closing price of the futures on the previous trading day*
- *No mark to market is done on the settlement day. The settlement is done on the basis of futures closing price on previous trading and the closing spot price on the day of settlement. Suppose on the Thursday the closing spot price was $0.805. harry will receive $1250 as the final settlement.*
- *Table showing cash flows of harry*

Day	Cash flows
Monday	+$625
Tuesday	-$1250
Wednesday	+$6250
Thursday	+$1250
Total	+$6875

Now there are two situations:

- (i) harry entered into the futures transactions for speculation – he pocketed the profit of $6875
- (ii) harry entered into the future transactions for hedging purpose – in this situation, harry may purchase 125000SFs in the open market, his net cost will be 0.75$ per SF (the rate at which he entered into future transaction for purchasing the SFs) details are as follows:

Cost of purchase 125000 SFs in the open market	: 125000*0.805	+$1,00625
receipts under future	:	-$6875
net cost	:	$93,750
net cost per SF93750$/125000SF	:	0.75 per SF

- Daily settlement reduces the chance of default on a futures contract. As the changes in the value of the underlying asset are recognized on each trading day, there is no accumulation of loss; the incentive to default is reduced. There is extremely low rate of default in futures market and the credit for this goes to the mark to market

Question

- Mr. M enters into one contract of purchasing futures of pounds on January 27, 2005 at a price of 1.80USD per pound. The standard size of one future contract is 1,00,000 pounds. Using rates of pounds on different dates: find gain/loss of Mr. M at this closing of each of the above mentioned dates

  - January 27 $1.78
  - January 28 $1.76
  - January 29 $1.73
  - January 30 $1.72
  - January 31 $1.81

- If the initial margin is $5000 per contract and maintenance margin is $3000 per contract, show Mr. M margin account (also called as equity account) and the additional deposits to be made (assume no withdrawals)

Answer

M Margin Account					
27th January	Mark to Market a/c	2000	27th January	Bank	5000
28th January	- Do -	2000	28th January	Bank	4000
29th January	- Do -	3000	29th January	Bank	3000
30th January	- Do -	1000	31st January	Mark to Market a/c	9000
31st January	Balance c/d	13000			
	Total	21000		Total	21000

Question

- A Singapore based firm exported goods to an Australian firm, invoice Australian dollars 5,000,000 on 2nd April, 2007. the payment is due on 25th June, 2007.
- On 18th April 2007 the finance manager of the Singapore firm got an indication that the SGD will appreciate against Australian Dollar (AD)
- The following exchange rates are quoted on 18th April 2007
  - Spot SGD/AD = 1.4760
  - Dec. 2007 futures contract SGD/AD = 1.4835
- The standard size of the futures contract is AD1,000,000. suggest the hedging strategies?
- Assuming that the finance manager follows your suggestions, find net cash inflow on 25th June, 2007 assuming that on that day the following rates were prevailed in the market:
  - Spot SGD/AD = 1.4275
  - Dec. 2007 futures contract SGD/Ad = 1.3998

Answer

- 18th April: sell 5 futures contracts (De.2007) of Ads @ 1AD = 1.4835SGD
- 25th June, 2007, close the position of above mentioned futures contracts @ 1AD = 1.3998SGD

- Cash inflows on 25th June 2007:
  - Receipt under futures (on closing the contracts)

5,000,000 (1.4835 – 1.3998)

sale proceeds of 5,000,000 Ads on spot basis 5,000,000 (1.4275)

7,55,600 SGD .

Question

- XYZ ltd. is an export oriented business house based in Mumbai. The company invoices in the customer's currency. Its receipt of $1,00,000 is due on Sept. 1, 2005
- Market information as at June 1, 2005:
- Exchange rates $/Re

spot	0.02140
1 month forward	0.02136
3 months forward	0.02127

currency future: contract size Rs.4,72,000

June	0.02126	
September	0.02118	
	Initial margin	Interest rates in India
June	Rs.10,000	7.50%
September	Rs.15,000	8.00%

- On September 1, 2005 the spot rate $/Re is 0.02133 and currency future rate is 0.02134. which of the following methods would be most advantageous for XYZ ltd.
- (a) using futures (b) using forwards (c) no hedging. It may be assumed that variation in the margin would be settled on the maturity of the future contracts.

Answer: as we are given the contract size of rupees, we should enter into futures contract of rupees. We have to purchase the rupees. We enter into the futures contract of purchasing the rupees.

- Futures
  - Purchase 10 “rupees sept. futures contracts @ Re.1 = $0.02188, details as: 100000/0.02118 = Rs47,21,435
  - No of contracts = 4721435/472000 = 10 contracts
  - Close the contract on 1st sept. @ Re.1 = 0.02134$
  - Receipt from futures contracts = 47,20,000 (0.02134 – 0.02118) = $755.20
- Calculation of net receipts under futures:
  - Sale proceeds of $1,00,755.20 on spot basis @ Re1 = $0.02133 = Rs.47,23,638
  - Interest payment on Rs.1,50,000 @ 8% p.a. for 3 months (margin is 15000 per contracts for 10 contracts = (3000)
  - Net receipts 47,23,638 – 3000 = Rs.47,20,638
- Receipts Under forward = 1,00,000/0.02127 = Rs.47,01,457
- Receipts under no hedging = 1,00,000/0.02133 = Rs.46,88,233
- Futures contract is recommended because of the maximum amount of net receipt

Question

- Nitrogen ltd. a UK company in the process of negotiating an order amounting to €4m with a large German retailer on 6 months credit. If successful, this will be the first time that nitrogen ltd has exported goods into highly competitive German market. The following three alternatives are being considered for managing the transaction risk before the order is finalized.
  i. Invoice the German firm in sterling using the invoice amount.
  ii. Alternative of invoicing the German firm in € and using forward exchange contract to hedge the transaction risk.
  iii. Invoice the German first in € and use sufficient 6 months sterling future contracts (to the nearly whole number) to hedge the transaction risk
- Following data is available
  - Spot rate €1.1750 - €1.1770/ £
  - 6 month forward premium 0.60 – 0.55 € cents
  - 6 month future contract is currently trading at €1.1760/£
  - 6 months future contract size is £62,500
  - Spot rate and 6 months future rate €1.1785/£
- Required
  - Calculate to the nearest £ the receipt for Nitrogen Ltd. under each of the three proposals
  - In your opinion, which alternative would you consider to be the most appropriate and the reason

Answer

- (i) Invoice in Sterling: $\frac{€40,00,000}{€1.1770/£} = £3398471$ $= £33,98,471$

- (ii) forward rate (premium) 1.1770 + 0.0055 = €1.1825/£
  - Cash flow under forward = $\frac{40,00,000}{1.1825} = £33,82,664$ $= £33,82,664$
- (iii)
  - Required amount of futures to be purchased = 40,00,000/1.1760 = 34,01,361£
  - No. of future contracts 34,01,361/62500 = 54 contracts
  - Amount of future contracts = 54 * 62500 = 33,75,000£
  - Purchase price of futures : €1.1760/£
  - Settlement price of futures : €1.1785/£
  - Profit per pound = €0.0025
  - Total profit = 0.0025 * 33,75,000 = €8438
  - Total number of € to be sold on spot basis = 40,08,438
- Cash inflow under futures = 40,08,438/1.1785 $= £34,01,305$

Question

- A Mumbai based firm exports woolen cloths to a Singapore firm, invoice Japanese yen 150 million on 15th April, 2007 credit period 2 months. The firm's banker agrees to buy these yens at the rate of 100 yens/$. At the same time it imports a machine from France invoice Euro 1.20 million credit period 2 months. The firm wants to hedge its foreign exchange risk through future contracts. The firm entered into a futures contract in London International Financial Futures and Option Exchange (LIFFE) on the basis of the following rates:
- 15th April, 2007
  - Spot rate: 1$ = 0.80€
  - June futures contract: 1$ = 0.79€ (contract size $1,00,000)
- Using the information, suggest the hedging strategy
- Suppose after 2 months the rates were
  - Spot rate – 1$ = 0.81€ and 1$ = Rs.40
  - June futures contract 1$ = 0.82€
- Explain the cash flow in rupee on 15th June, 2007

Answer

- Amount to be received from Singapore firm = 150m Japanese Yen
- This amount will be exchange with the bank for 1.5m$
- The Mumbai firm should enter into fifteen June future contracts of selling 1.5m$ @ 1$ = 0.79€
- On 15th June
  - Payment on closing the future contracts @ 0.82€ = 15,00,000 * 0.03 = 45000€
  - Cash inflow in rupees
  - Sale proceeds of $ (on spot basis) 15,00,000 * 40 Rs.6,00,00,000
  - Cost of buying 12,45,000€ on spot basis
    - For 12,45,000€ we require 12,45,000/0.81 i.e.$15,37,037
    - i.e. 15,37,037 * 40 Rs.6,14,81,480
- Net cash outflow i.e. loss in spite of hedging Rs.14,81,480

Question

- A Mumbai based firm exports readymade garments to a Sri Lanka based firm, on 15th April, 2007, invoice $0.10m, credit period 1 month. The firm wants to hedge its foreign exchange risk through futures contracts. The firm contracted a London based foreign currency expert. The expert opined that rupee is almost perfectly correlated with AUD, i.e. when AUD appreciates against USD, the rupee also appreciates against USD and vice versa; hence the firm may enter into USD/AD futures contract. As per the expert's advice, the firm entered into a futures contract in LIFFE.
- Using the following rates, determine the cash flows on 15th May, 2007. Contract size $1,00,000
- 15th April 2007
  - Spot rate: 1$ = Rs.40
  - 1$ = 1.20 AUD
  - June future contracts: 1$ = 1.25AUD
- 15th May 2007
  - Spot rate: 1$ = Rs.39
  - 1$ = 1.25AUD
  - June future contract: 1$ = 1.20AUD

Answer: as we are given the contract size of $, we should enter into future contract of $. We have to sell $. We enter into the futures contract of selling the $

- 15th April
  - The Mumbai firm should enter into a June futures contract selling 1,00,000 $ @ 1.25AUD
- 15th May
  - Receipt on closing of futures contract = 5000AUD
- 15th May 2007 cash flow in rupees
  - Sale proceeds of 1,00,000 US$ on spot basis Rs.39,00,000
  - Sale proceeds of 5000 AUDs received on closing of futures Rs.1,56,000
  - Total cash inflows Rs.40,56,000

Question

- A firm bottom line is hit when USD depreciates. Suppose at present the foreign exchange rate is 1£ =2$, if the rate moves to 2.05$, the firm suffers a loss of $2,00,000. suggest

- Answer
  - The firm suffers loss on appreciation of £. It means the firm has to buy £
  - Corresponding to $0.05 loss, there is buying of 1 £
  - Corresponding to $,200,000 loss, there is buying of 40,00,000 £
  - It means the firm has to buy £40,00,000 for its business activities.
  - To cover the risk the firm should buy £40,00,000 in the futures market

Question

- In Singapore, the forward price on SGD for delivery in 60 days is quoted at 1.60 per USD. The futures market price for a similar contract is 0.65$ per SGD. is there some arbitrage opportunity

- Answer
  - Forward price: 1$ = 1.60SGD
  - Future prices are in indirect quotes. Hence future price
    - 1SGD = 0.65$ i.e. 1$ = 1.5385SGD

  - Arbitrage opportunity is there. Buy $ in future market @ 1.5835 SGD
  - Sell $ in forward market @ 1.60SGD.
  - The difference between the two rates is profit

Options

Options

- Forwards and futures provide protection against adverse movements in exchange rates.
- They have one common disadvantage that the buyer cannot benefit from favorable movements in exchange rates, since he is obliged to sell/buy currencies at a predetermined rate.
- This apparently led some commercial banks to offer “currency options” to their customers in 1983
- A currency option is a financial instrument that gives the buyer of the option the right but not the obligation to sell or to buy fixed amount of currency at a fixed price on a fixed future date/up to a future date.
- In India currency options are available only in USD
- The seller of the option must fulfill the contract if the buyer so desires. Generally the options are cash settled.

Terms in options

- Call option: an option giving the buyer of the option, the right but not the obligation to BUY a currency
- Put option: an option giving the buyer of an option, the right but not the obligation to SELL a currency
- Strike price: the fixed price, at which the buyer of option contract can exercise his option to buy/sell the currency
- Expiry date: the last date on which the option may be exercised
- European option: an option which can be exercised only on the specified date
- American option: an option which can be exercised on any date up to expiry date.

How companies can use foreign currency options: the following example illustrates how a US company needing to pay Japanese Yen can use currency options.

- An American manufacturer Mr. Z purchases Japanese goods worth 120m yen, credit terms 1 month i.e. the manufacturer has to pay, after one month, the Japanese company 120m yen, no matter what happens to the yen-dollar rate.

- Mr. Z buys a foreign currency option which gives him the right but not the obligation to buy 120m yen at 110yens per dollar. The option carries a premium or cost of US $0.02 million.

Now there can be three possibilities

- **If Yen rises**: suppose after 3 months, yen rises to 100 yen per USD. If Mr. Z purchases yens from the market, he has to pay 120m/100 i.e. 1.20m USD. If he exercises the option, he can purchase 120m yens for 1.0909m USD. He should exercise the option. Net savings of 0.0891m USD (even after meeting the premium for purchasing the option). Mr. Z could protect himself against adverse movement in foreign exchange rate.
- **If Yen is stable**: Mr. Z purchases 120m yen either from the market or under his option. He has to pay 1.0909m USD. Cost is 0.02m USD i.e. premium for purchasing option.
- **If yen falls**: say 120 yens per USD. Mr. Z will purchase yens from the market for 1m USD.
- **Thus Mr. Z gains from favorable movement in foreign exchange rates**.

- RBI has introduced cross currency options with effect from January 1, 1994. only authorized dealers (AD) have been allowed to write cross currency options. In July, 2003, the RBI has introduced, rupee – currency options as well. Currency options are not popular in India.

- Suppose an AD enters into a contract with Y Ltd. under which Y ltd. pays the AD Rs.10,000 (option premium or option price) and in return AD gives them the right of buying 10000$ at Rs.40 per $ after 1 month from the date of contract. On maturity Y Ltd. may buy10000$ from the AD at Rs.40 (or may not buy).
  - Suppose spot price on that date is below 40, he may or may not buy. If the spot price is above Rs.40, it is natural that Y will exercise his option i.e. he will buy the $.
  - In this example Y ltd. has limited loss amounting to Rs.10,000 but there is no limit to his gain. The option referred to in this example is “European Call Option”

- In the money option: an option is said to be “In the money” when it is advantageous to exercise it.

- Out of the money option: an option is said to be “out of the money” when it is disadvantageous to exercise it.
  - (naturally, is the situation, the option owner won’t exercise it.)

- At the money option: if the option holder does not lose or gain whether he exercise his option or not, the option is said to be at the money. (normally it is assumed in this situation that option owner will not exercise option in this situation)

- Value of call option: the options are cash settled (and not delivery based) by the term “value of option on the date of maturity” we mean the amount that the option buyer receives on exercising the option.

There are two parties in an option contract

- Option writer or option seller – he gives the option to the other party. In the above example the AD is option writer. The AD receives the option premium or option price from the Y Ltd. In the above example Rs.10,000 is option premium or option price. In other words, the option write (also called as the option seller) receives the option premium.

- Option owner or option holder – he gets “the option” or “the right (but not the obligation)” from the option writer against payment of “option premium” or “option price”. In the above example Y ltd. is option owner.

- Rule: the right or option or choice of exercising or not exercising the option is only with the option buyer. He may or may not exercise the option. Thus, the buyer of the call option will exercise the option: he will buy on the basis of the option contract if strike price is less than the spot price i.e. he can buy the underlying asset having higher market value by paying the less amount because he has the right to do so.
- Suppose you purchase the call option of 1$ = Rs.40 on a fixed maturity date. Suppose the maturity date USD is being quoted in the market @ Rs.41. naturally, you will exercise the option as through exercising the option you can purchase USD @ Rs.40 while the market rate is 41.
- But, the options are generally cash settled. Hence for exercising the option neither you will pay Rs.40 not the option writer will pay you 1USD. The option wrier will give you the difference of Re.1 and transaction will be settled.

Question

Consider the following six cases of call options on UK pounds						
	Case	Case	Case	Case	Case	Case
	1	2	3	4	5	6
Spot price at expiration (Rs./£)	75	76	77	78	79	80
Strike price (Rs./£)	77	77	77	77	77	77

Find in each case
(i) whether the option is in the money, at the money or out of the money and
(ii) value of option (to its owner) at expiration

Answer

Case	In, Out, or At	Value
1	Out	0
2	Out	0
3	At	0
4	In	1
5	In	2
6	In	3

What will be your Answer if the options referred in earlier question are put option

Case	In, Out, or At	Value
1	In	2
2	In	1
3	At	0
4	Out	0
5	Out	0
6	Out	0

Question

- Motion Ltd. has purchased a 3 months call option of Euro with an exercise price of Rs.51. determine the value of call option at expiration if the Euro price at expiration turns out to be either 47 or 54

- Answer

Spot price on maturity (Rs.)	Value call option
47	0
54	3

Question

- K ltd. purchased a call 3 month call option on Kuwaiti Dinar from an AD at a strike price of Rs.160. call premium Rs.9. current price Rs.185. fine the value of the option on expiration if prices at expiration are Rs.140; 150; 160; 170; or 180. what are the payoffs on different prices?

  - Current price of Rs.185 is irrelevant for the question
  - Value of option means the amount to be received by the call buyer on the exercise of the option. It is calculated ignoring the option premium/ option price
  - Pay off means profit/ loss on the option. It is equal to value of option is only with the option buyer. He/she may or may not exercise the option.

Answer

Spot price	Value	Pay-offs
140	0	-9
150	0	-9
160	0	-9
170	10	+1
180	20	+11

Question: Mr. X buys a European call option to purchase 1£ at a strike price of $1.65 and at a premium of $0.02. the current spot rate is 1.64. calculate his gain/loss if the spot rates on the date of maturity are 1.62. 1.63, 1.64, 1.65,1.66 and 1.69

Spot rate on maturity	Gain on exercising value	Premium	Net gain/loss
1.62	Not to be exercised	0.02	Loss 0.02
1.63	Not to be exercised	0.02	Loss 0.02
1.64	Not to be exercised	0.02	Loss 0.02
1.65	0	0.02	Loss 0.02
1.66	0.01	0.02	Loss 0.01
1.69	0.04	0.02	Gain 0.02

Question

- You are planning to buy a call option with strike price of Rs.24 per SF. On the date of maturity probability profile of spot rate is expected to be:

• Rs/SF	21	23	25	27
• Probability	0.20	0.30	0.30	0.20

- What should be the option premium to enable you to breakeven?

Answer

Spot rate on maturity	Gain on exercising	Probability	Expected gain
21	0	0.20	0.00
23	0	0.30	0.00
25	1	0.30	0.30
27	3	0.20	0.60
Total expected gain			0.90

For break even expected gain should be equal to cost or premium of option. Hence, option premiums Should be Re.0.90

Question

- A company is planning to cover its expected 3 month receivable of $2,00,000 by buying a put option @ Rs.36/$. The premium payable is Re.1/$. The probability profile of exchange rate after 3 months is:

• Probability	0.20	0.30	0.30	0.20
• Expected Rate	34	34.50	35.00	36.50

- Should he buy the option? Ignore interest

Answer

Spot rate on maturity	Pay offs	Probability	Expected pay off
34.00	1.00	0.20	0.20
34.50	0.50	0.30	0.15
35.00	0.00	0.30	0
36.50	-1.00	0.20	-0.20
Total expected pay off			+0.15

The company may buy put option as the expected pay off of this action is positive

Question

- A person buys the following option simultaneously (same day of maturity)

Type	Strike Price	Premium
Call	$0.64/DM	$0.01
Put	$0.64/DM	$0.02

- For what range of spot prices, can he hope to make profit on maturity?

- In this question, the buyer of the option has two rights:
  - He may buy DM on maturity @ 1DM = $0.64
  - He may sell DM on maturity @ 1DM = 0.64$

- He will exercise call option i.e. he will buy DM under call option if spot price on maturity is >$0.64
- He will exercise put option i.e. he will sell DM under put option if price of DM on maturity is <$0.64

- Profit will be there only if the option(s) is/are exercised; otherwise there will be loss of premium.

- The exercising of call option and that of put option are manually exclusive i.e. either call will be exercised or put will be exercised.

Total premium is $0.03. for profit, the value of the option that is to be exercised should be more than $0.03. this will be there in the following two mutually exclusive cases:

Spot price is > 0.67 (in this case the call will be exercised)
Spot price is < 0.61 (in this case the put will be exercised)

Price on maturity	Gain/loss
0.59	+0.02
0.60	+0.01
0.61	0
0.62	-0.01
0.63	-0.02
0.64	-0.03
0.65	-0.02
0.66	-0.01
0.67	0
0.68	+0.01
0.69	+0.02

Question

- You write a European put option of three months maturity at a strike price of Rs.35 per USD. Premium Re1/$. To cover your exposure you sell $ three months forward at the rate of Rs.35.50. construct the pay off table, if spot price on the date of maturity is Rs.32,33,34……ignore interest
- Answer

Spot price on maturity	Amount to be paid on maturity	Option premium	Sales/$	Cost	Profit/loss
32	-3	+1	+35.5	-32	+1.50
33	-2	+1	+35.5	-33	+1.50
34	-1	+1	+35.5	-34	+1.50
35	0	+1	+35.5	-35	+1.50
36	0	+1	+35.5	-36	+0.50
37	0	+1	+35.5	-37	-0.50
38	0	+1	+35.5	-38	-1.50

Question

- A London based firm has supplied a nuclear machine to a New York based firm for $120m, payment due in 4 months time. The current spot rate is 1£ = $1.58. the London firm has apprehensions that USD may decline against British Pound. The London firm is considering the proposal of buying a put option, 4 months maturity, strike price 1£ = $1.60. the option premium is $0.0002 per £. Explain the position of the London firm on maturity.

Answer

- The London firm has to sell the USDs. It has bought a put (the put given him the right of selling the USDs on maturity @ 1£ = $1.60
  - Strike price (the price at which the London firm can sell$ on maturity: 1$ = 1/1.60 i.e. £0.625
  - On exercising the option, its buyer will get 120m * 0.625 i.e. 75m £
  - Option premium is $0.0002 per £
  - Total option premium is 75m * 0.0002 i.e. 15000$
  - 15000$ = 15000/1.58 i.e. £9493.67 say £9494

- (i) if the spot price of $ on maturity is £0.625: ($ is stable)
  - 120m$ will be sold @ £0.625/$ (either in option market or under the option)
  - Gross realization = £75m
  - Put premium = £9494
  - Net realization = £7,49,90,506
- (ii) if the spot price of $ on maturity is less than £0.625: ($ declines)
  - 120m$ will be sold @ £0.625/$ (exercising the option)
  - Gross realization = £75m
  - Put premium = £9494
  - Net realization = £7,49,90,506
- (iii) if the spot price on maturity is more than £0.625/$ (USD appreciates):
  - The net realization will be higher than £7,49,90,506. for example if the $ rises to £0.65, the firm won't exercise the option, the $ proceeds may be sold in the market and get 120m * 0.65 i.e. £78m, the net proceeds will be 7,80,00,000 – 9494 i.e. £7,79,90,506

Question

- An Indian firm imported a supercomputer from USA for 1.50m USD on 1st July 2007. the payment is due on 30th Sept. 2007. the firm has three options
  a) no hedging
  b) 3 months forward at Rs.40
  c) Call option strike price Rs.39.70, maturity 30th September, 2007, premium Rs.0.40 per USD.

- Find the expected spot rate on 30th September 2007, that will make the firm indifferent between
  - No hedging and forward
  - No hedging and call
  - Forward and call

Answer

- Cost under forward Rs.40 per USD. To be indifferent between "forward" and "no hedging", the expected spot rate on 30th September, 2007 should be Rs.40.
- Cost under call option Rs.40.10 per $. To be indifferent between "call" and "no hedging" the expected rate should be Rs.40.10/$

Expected spot price on 30th September	Cost under call	Cost under no hedging
40.00	40.10	40.00
40.10	40.10	40.10
40.20	40.10	40.20

- Cost under forward Rs.40/$. To be indifferent between forward and option, the cost under option should be Rs.40. for this the spot price on maturity should be Rs.39.60

Expected spot price on maturity	Forward	Call	
39.60	40	39.60 + 0.40 = 40.00	Indifferent
39.70	40	39.70 + 0.40 = 40.10	Not indifferent
39.50	40	39.50 + 0.40 = 39.90	Not indifferent

Question

- An American firm is under obligation to pay interest of CD1010000 and CD705000 on 31st July and 30th September respectively. The firm is risk averse and its policy is to hedge the risks involved in all foreign currency transactions. The finance manager of the firm is thinking of hedging the risk considering two methods i.e. fixed forward or option contracts.
- It is now 30th June. Following quotations regarding rates of exchange $/CD from the firm's bank were obtained:
- Spot 0.9284-0.9288; 1 month forward 0.9301; 3 months forward 0.9356
- Price of CD/$ option on a US stock exchange (cents per CD payable on the purchase of the option, contract size CD 50,000 as follows:

Strike price ($/CD)	Call		Put	
	July	September	July	September
0.93	1.56	2.56	0.88	1.75
0.94	1.02	NA	NA	NA
0.95	0.65	1.64	1.92	2.34

- According to the suggestion of the finance manager, if options are to be used, one month option should be bought at a strike price of 94 cents and 3 months option at a strike price of 95 cents and for the remainder uncovered by options the firm would bear the risk itself. For this, it would use forward rate as the best estimate of spot. Transaction cost are ignored
- Recommend, which of the above two methods would be appropriate for the American firm to hedge its foreign exchange risk on the two interest payments.

Answer

- 1 month
  - Cost under forward: 10,10,000 x 0.9301 = **$9,39,401**
  - Option: call option may be purchased on 10,00,000 CD at strike price of 0.94$/CD, call premium: 10,00,000 x 0.0102 = 10,200$
  - Assuming expected spot price on maturity = $0.9301
  - Call would not be exercised. All 10,10,000 CD will be purchased at 0.9301
    - Cost of purchase: 10,10,000 x 0.9301 =$9,39,401
    - Premium =$10,200
    - **Total cost** **=$9,49,601**
- Recommendation: forward is recommended on account of lower amount of cost

Answer

- 3 months
  - Cost under forward: 7,05,000 x 0.9356 = **$6,59,598**
  - Option: call option may be purchased on 7,00,000 CD at strike price of 0.95$/CD, call premium: 7,00,000 x 0.0164 = 11,480$
  - Assuming expected spot price on maturity = $0.9356
  - Call would not be exercised. All 7,05,000 CD will be purchased at 0.9356
    - Cost of purchase: 7,05,000 x 0.9356 =$6,59,598
    - Premium =$11,480
    - **Total cost** **=$6,71,078**
- Recommendation: forward is recommended on account of lower amount of cost

Currency Swaps

Currency swaps

- In a currency swap, two parties agree to pay each other's debt obligation denominated in different currencies.

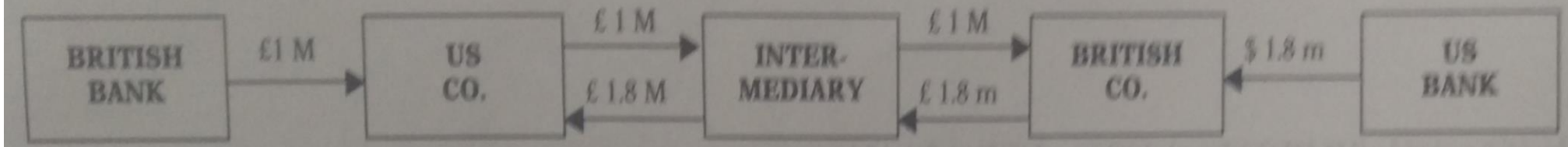
- A currency swap involves
  - An exchange of principal amounts today
  - An exchange of interest payment during the currency of loan; and
  - A re-exchange of principal amounts at the time of maturity

Example

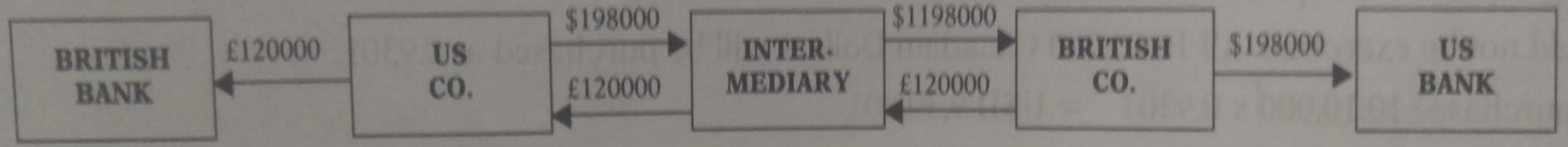
- Suppose 1£ = 1.80$. A company raised a loan of 1m£ from some British bank for three years at interest rate of 12%. The US company is supposed to pay 1,20,00£ as interest at the end of each three years. At the end of third year, the US company should pay1m £. At the same time a British company raised 11% loan of $1.80m for 3 years from some US bank. The British company has to pay $1,98,000 annually for 3 years and at the end of third year, it has to pay $1.80m. An intermediary brings the two companies together and the swap is arranged.

- These two companies will
  - Exchange the amount raised, i.e. the US company will pay 1m £ to the British company and British company will pay 1.80m$ to the US company.
  - Exchange the interest liability of each other at the end of each year i.e. the US company will pay 1,98,000$ to British company so that it can meet its interest obligation and the British company will pay 1,20,000 £ to US company so that it can meet its interest obligation.
  - At the end of three years US company pays 1.80m$ to the British company so that it can meet its debt obligation. Similarly, the British company pays 1m £ to the US company so that it can meet its debt obligation.

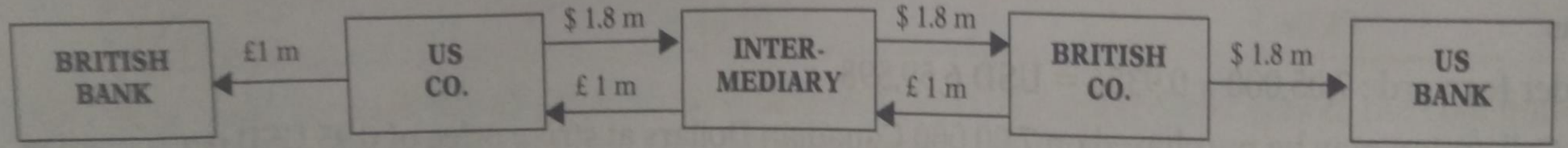
AT TIME OF RAISING LOAN



AT THE END OF EACH OF THREE YEARS



AT THE END OF EACH OF THREE YEARS



CURRENCY SWAP

Question

- A UK firm is to advance a 3 years loan of £1,00,000 to its Japanese subsidiary. A Japanese firm is to advance a 3 years loan of ¥2,00,00,000 to its UK subsidiary. Both the firm are brought to a negotiation table by a finance corporation and a deal is negotiated. Under the deal, the UK firm will advance £1,00,000 to UK subsidiary of Japanese firm at interest of 11% p.a. compounded annually payable on maturity. The Japanese firm will advance a loan of ¥2,00,00,000 to Japanese subsidiary of UK firm at interest of 10% p.a. compounded annually payable on maturity. The current exchange rate is 1£ = 200¥. However, the £ is expected to decline by 4¥ over each of next 3 years. Compare the £ value of receivables of each of the two firms at the end of 3 years.

Answer

- UK firm will get £1,36,763 from UK subsidiary of the Japanese firm

- The Japanese firm will get ¥ 2,66,20,000 from the Japanese subsidiary of the UK firm the £ value of this receivable is expected to be 2,66,20,000/188 i.e. £1,41,596

Question

- G Plc has been invited to purchase and operate a telecommunications center in the republic of Perdia. The purchase price is 2000m rubbits. The centre would be sold back to the Perdian government for an agreed price of 4000m rubbits after 3 years. G plc would supply three years technical expertise and training for local staff, for 3 years @ annual fee of 40m rubbits.
- G Plc bankers have suggested using a currency swap for the purchse price of the factory, with a swap of principal immediately and in 3 years time, both swaps at today's spot rate. The bank would charge a fee of 0.25% per year (in sterling) for arranging the swap.
- Exchange rates:
  - Spot 85.4 rubbits/ £
  - 1 year forward rate 93.94 rubbits/ £
  - 2 year forward rate 103.334 rubbits/ £
  - 3 year forward rate 113.67 rubbits/ £
- Assuming the swap takes place as described, provide a reasoned analysis, as to whether G Plc should accept the invitation or not. The relevant risk adjusted discount rate may be assumed to be 15% per year. Ignore tax.

Answer:
2000m rubbits = 2000m/85.40 = £23.4192m
bank charges = 23.4192m x 0.0025 = £0.0585m p.a.

	Period	Cash flow in £
	0	(£23.4192m)
Bank charges	1 – 3	(0.0585) p.a.
Annual fees	1	+40m/93.94 = 0.4258m
Annual fees	2	+40m/103.334 = 0.3871m
Annual fees	3	=40m/113.67 = 0.3519m
Contractual payments (swap)	3	+23.4192m
Contractual payments (others)	3	+2000m/113.67 = +17.598m

DCF analysis of the project

	Period	PVF	CF	PV
Swap payment	0	1	-23.4192	-23.4192
Bank charges	1 – 3	2.283	-0.0585 p.a.	-0.1336
Annual fees	1	0.870	+0.4258	0.3704
Annual fees	2	0.756	+0.3871	0.2926
Annual fees	3	0.658	+0.3519	0.2316
Contractual receipts (swap)	3	0.658	+23.4192	15.4098
Contractual receipts (others)	3	0.658	+17.5948	11.5773
NPV				+4.3289

Question

- A US company has been offered a contract of constructing a dam in an undeveloped country which it shall be paid Peasas, the local currency of that country. The construction will take one year to complete. On completion the US company will receive 3000m peasas. The project requires an immediate spending of 2000m peasas. The US company requires a return of 10% in dollar terms. Given the following rates, should the project be accepted
  - Spot rate: 1$ = 50 peasas
  - 1 year forward rate: 1$ = 48 peasas

- Will your answer change if the bank offers a currency swap on the following terms?
  - The US company may lend $40m to the bank for 1 year at zero interest rate
  - The bank will lend the US company 2000m peasas for 1 year at 10% p.a. interest; the loan and the interest to be paid in peasas.

Answer

- Period cash flow (USD)
- 0 -2000m/50 = -40m
- 1 +3000m/48 = +62.50m
- DCF analysis of the project

	Period	PVF	CF	PV
Investment	0	1	-40m	-40m
Realization	1	0.909	+62.50m	+56.8125m
NPV				+16.8125m

- As the NPV is positive the project may be accepted

Swap

- Period cash flows (USD)
- 0 -40m
- 1 +40m
- 1 +(3000-2200)/48 = 16.67m
- DCF analysis of the project

	Period	PVF	CF	PV
Investment	0	1	-40m	-40m
Realization	1	0.909	+56.67m	+51.5131m
NPV				+11.5131

- The swap option has reduced the NPV

Question

- A Canadian company has been awarded a contract to build a power house in XYZ country. The currency of that currency is XYZ mark. The contract price is 150m XYZ mark, to be paid on the completion of the work. The contract will be completed in one year. The Canadian company will be required to spend 60m XYZ mark immediately and another 60m after 9 months. The required rate of return is 12%
- A bank has offered the following swap
  - (i) a currency swap of 60m XYZ mark @ 12 XYZ mark per Canadian dollar immediately and a reverse currency swap for the same amount at the same exchange rate after one year
  - The Canadian company will pay interest @ 15% p.a. payable in XYZ mark after 1 year. The bank will pay interest @ 10% payable in Canadian dollars after one year
- Applying the following foreign exchange rates and assuming the swaps is undertaken, advise whether the contract should be taken
  - Spot rate 1CD = 12XYZ mark
  - 1year forward 1CD = 13XYZ marks

Answer

- Working notes
- (i) spot 12 XYZ mark
  - 1 year forward — 13 XYZ marks
  - LHS increases by 12, — RHS increase by 1
  - LHS increases by 1 — RHS increases by 1/12
  - LHS increases by 9 — RHS increases by 0.75
  - Therefore 9 month forward rate: — 12 + 0.75 = 12.75
- (ii) spending after 9 months – 60m/12.75 = 4.7059m CD
- (iii) cash flows at the end of the year
  - Contract price — 150m XYZ Mark
  - Payment under swap with interest — -69m XYZ mark — 81m XYZ Mark
  - Converted into CD on forward basis: 81mXYZmark/13 XYZ mark — 6.2308 CD
- (iv) PV factor of 9 months = 1/1.09 = 0.917

DCF analysis of the project (CD millions)

	Period	PVF	CF	PV
Payment to bank under swap	0	1	-5	-5
Spending	0.75	0.917	-4.7059	-4.3153
Receipt under swap with interest	1	0.893	+5.50	+4.9115
Other realizations	1	0.893	+6.2308	+5.564
NPV				+1.1602

The project may be taken up as NPV is positive

Money Market Operations

- Money market operations are another tool to for foreign exchange risk management and works as follows
- Foreign currency to be received in future
  - (a) Borrow in foreign currency. The amount of borrowing should be such that “amount borrowed + interest on it” should be equal to foreign currency to be received
  - For example: an Indian firm is to receive export proceeds of $1,05,000 after six months from today. $ can be borrowed at 10% p.a.. If the firm wants to go for money market operations for covering the foreign exchange risk, it should borrow $1,00,000 for 6 months. On maturity of this borrowing, the liability with interest will be $1,05,000. this liability would be settled from the receipt of the export proceeds of the same amount (to be received on the same date)
  - In other words, the borrowing in foreign currency should be equal to PV of foreign currency to be received in future, discounting rate being the rate at which the currency can be borrowed.

- (b) convert the borrowed amount into home currency and lend this amount (in home currency) for the period during which foreign currency receipt is outstanding. Get the proceeds of this lending with interest in home currency on maturity.

- (c) use foreign currency receipt to repay the amount borrowed + interest on it in foreign currency

Question

- An Indian firm exports leather goods to a US firm, invoice $1,02,000, credit terms 3 months. The foreign exchange market is quite volatile. Suggest the plan for hedging the foreign exchange risk, using the data give below

  - Spot rate 1$ = Rs.45.00/45.10
  - 3 months forward rate 1$ = Rs.45.50/45.60
  - Interest rates Rs. 12% and $ 8%

Answer

- On the basis of the data given, two alternative ways are possible
  - Forward: under this alternative, the exporter will get Rs.46,41,000
  - Money market operations
    - Borrows $1,00,000 for 3 months at interest rate of 8% p.a. after 3 months, the firm has to pay $1,02,000. this payment should be made using the export proceeds (after 3 months: the Indian firm will get $1,02,000 as export proceeds, it has to pay borrowings with interest amounting to $1,02,000. no foreign exchange risk after 3 months it will receive as well pay the same amount of foreign currency.
    - Convert the borrowed amount of $1,00,000 in Rupees, get Rs.45,00,000. invest this amount at the rate of 12% p.a. for 3 months. Get Rs.46,35,000 on the maturity of this investment
  - Comparison
    - Forward – net receipt Rs.46,41,000 and Money market operation net receipt Rs.46,35,000 and hence forward is recommended.

Question

- A London based firm has received an order from a Paris firm; the order is worth £2,50,000 at today's spot rate. It has also received an order from Tanzanian worth £3,00,000 at today's spot rate. Both the importers will make payments in their respective currencies after 3 months. The Paris firm will pay in French Francs and Tanzanian firm in Tanzanian shillings. The London firm uses forward as hedging technique, where possible
- Foreign exchange rates:

	FFs/$	$/£	Tanzanian Shillings/£
Spot	5.60	1.50	1,500
3 month forward	5.70	1.56	Not available

- Interest rates (p.a.)

	Deposit	Borrowings
£	6%	9%
Tanzanian Shillings	10%	Not available
$	3%	4%

- The Tanzanian firm has made an alternative offer; it has offered to pay $4,50,000, instead of making the payment in its own currency:

1. Calculate the receipt in Pounds from Paris order, assume that the London frim used forward contract for hedging
2. The London firm seeks your advise whether it should accept the alternative offer of the Tanzanian firm or instead accept the payment in Tanzanian shillings
3. Calculate the receipts in Pounds from Tanzanian firm, assuming the London firm accepted the alternative offer in the following two cases:
   a) The London firm opts for forward contract
   b) The London firm opts for Money market operations

Answer

- (I) order value in FF = 2,50,000 x 1.50 x 5.60 = 21,00,000FF
  - £ receivable under 3 months forward = $\frac{21,00,000}{5.70 \times 1.56} = 2,36,167.34$
- (II) as no hedging is available for Tanzanian's currency, it will involve very high risk . Hence this is not recommended. So the $ option is recommended.
- (III) Forward 4,50,000/1.56 i.e. £2,88,461.54
  - Money market operations
  - (a) Dollars to be borrowed = 4,50,000/1.01 = 4,45,544.55
    - (dollars borrowed + with interest will be paid using 4,50,000$ to be received from Tanzania)
  - (b) convert borrowed $ into £
    - £ amount = 4,45,544.45/1.50 = £2,97,029.70
  - (c) invest for 3 months and receive on maturity = 2,97,029.70 x 1.015 i.e. £3,01,485.15
- Money market operation is recommended

Question

- A British firm has invoiced certain goods to a Washington based firm; credit terms: 6 months, invoice amount $12m. The finance director of the British Firm. Mr. Lee, is considering the following two options for covering the foreign exchange risk, you please advise:

i. borrow $12m, covert into pounds, repay the borrowings using the receipts from Washington firm.
ii. enter into a six months forward contract to sell $ 12m, meanwhile borrow the equivalent amount in pounds.

- Spot rate 1£ = 1.60$ Six month forward 1£ = 1.50$
- Interest rate: $4% p.a. £ 6% p.a.

Answer

I Method		
	Period	Cash flow £
$ borrowings converted into £	0	+75,00,000
Payment of interest (purchase 240000$ on forward basis)	1	-1,60,000
II Method	Period	Cash Flow £
Borrow	0	+75,00,000
Repayment with interest	1	-77,25,000
Receipts under forward	1	+80,00,000
Net amount	1	+2,75,000

Question

- A UK firm has supplied certain software to a German firm, invoice DM 1.5m, payable after 2 months. The finance director of the UK firm, Mr. Lee, is considering the following two options for covering the foreign exchange risk, you please advice

    i. Sell 1.50m DM on 2 months forward basis
    ii. Borrow 1.50m DM for two months. Convert into pounds. Use the DM proceeds to repay the borrowings

- Interest rates £6% DM12%
- Spot rate 1£ = 2.59DM; 2 month forward rate 1£ = 2.40DM

Answer

- I method
  - Cash in flow on forward basis after two months = £6,25,00

- II method
  - Convert borrowed 15,00,000DM into 6,00,000 £
  - Invest this £ amount for 2 months at interest rate of 6% p.a. (interest for 2 months = 1%)
  - Cash inflows after 2 months from above investment: £6,00,000(1.01) i.e. £6,06,000
  - Cash outflow after 2 months for purchasing of 30,000DM on forward basis for payment of interest = £12,500
  - Net £ receipts after 2 months under II method = 6,06,000 – 12,500 = £5,93,500

Foreign exchange is to be paid in future

- Purchase foreign currency. The amount of purchase should be equal to present value of foreign currency to be paid in future. The discounting rate being the rate at which it can be lent.
- Lend the foreign currency purchased above, under (a) for the period during which foreign currency payment is outstanding.
- Receive the proceeds of above lending (with interest) and use the same for making payment in foreign currency.
- Home currency required for purchasing the foreign currency under (a) above, should be borrowed in home currency. It should be repaid on maturity, with interest, in home currency.

Question

- An Indian firm imports leather goods from a US firm, invoice $1,02,000, credit term 3 months. The importer firm in anticipating rise in dollar rate. Suggest the plan for hedging the foreign exchange risk, using the data given below:

- Spot rate 1$ = Rs.45.00/45.10
- 3 months forward rate 1$ = Rs.45.50/45.60
- Interest rates Rs. 12% $ 8%

Answer

- On the basis of the date given, two alternative ways are possible:
- (I) forward: under this alternative, the importer will pay Rs.46,51,200
- (II) money market operation:
  - (i) purchase $100,000. invest this amount for three months at interest of 8%. Get $1,02,000 after three months. Use this amount to pay the import bill.
  - (ii) rupees amount required to purchase $1,00,000 = Rs.45,10,000. borrow this amount at interest rate of 12% for 3 months. Pay this borrowing with interest i.e. Rs.46,45,300 on maturity of this borrowings

- Net payment in rupees under forward after 3 months Rs.46,51,200
- Net payment in rupees under money market operations Rs.46,45,300

Question

- Lammer Plc is a UK based company that regularly trades with companies in the USA. Several large transactions are due in five months time. These are shown below. The transactions in 000’ units of the currencies shown

	Exports to:	Imports from
• Company 1	$490	£150
• Company 2	------	$890
• Company 3	£110	$750

- Exchange rates $/ £
  - Spot 1.9156/1.9210
  - 3 month forward 1.9066/1.9120
  - 1 year forward 1.8901/1.8945
- Annual interest rates available to Lammer Plc.

	Borrowings	Investing
Sterling up to 6 months	5.5%	4.2%
Dollar up to 6 months	4.0%	2.0%

- How the five month currency risk should be hedged? Consider forward and money market operations. What is estimated cash inflow/outflow on the date of maturity under each of two alternatives i.e. forward and money market operations.

Answer

- The UK company has to hedge net outflow of $1150 thousands. (No hedging is done for home currency transactions)
- Forward: the UK firm shall be purchasing the $ i.e. the bank shall be purchasing £. The bid will be applicable
  - 3 months bid 1.9066$
  - 12 months bid 1.8901$
  - LHS ↑ by 9, RHS ↓ by 0.0165
  - LHS ↑ by 1, RHS ↓ by 0.001833
  - LHS ↑ by 2, RHS ↓ by 0.003666
  - 5 months forward bid: 1£ = 1.9029$
- Cost of purchasing 1150 thousand $ on 5 months forward basis = 11,50,000/1.9029 = £6,04,341

The UK firm has a liability of $1150 thousands. It should purchase such an amount of $ that by investing that (the purchased amount) for 5 months, the UK firm will get $1150 thousands (so that the UK firm can meet its liability)

- Money Market Operations
- Interest on investment of Dollars = 2 x 5/12 = 0.8333%
- Lets purchase $1150 thousands/1.0083333 i.e. $1140.50 thousands
  - Invest this dollar amount (in dollars) @ 2% p.a. for 5 months
  - Investment proceeds = 1150 thousand dollars
  - Use this investment proceeds to meet the liability of $1150 thousands 9after 5 months from today
  - To purchase 1140.50 thousand dollars, we require 1140.50 thousands/1.9156 i.e.595.37 thousands £
  - Lets borrow £595.37 thousands. Use this amount for purchasing $1140.50 thousands
  - Repay the borrowed home currency £ after 5 months, along with interest @ 5.50% p.a. total amount of interest = 595.37 x (5.50/100) x (5/12) = £13.64 thousands
  - Total cash out flow = 595.37 + 13.64 i.e. £609.01 thousands

- Statement showing cash outflow under each of two alternatives
  - Cash outflow in October (£’000) – Forward = 604
  - Cash outflow in October (£’000) – money market operations 609

Question

- A UK company has to pay 5m Ads after six months from today to a Sydney based firm. Given the following data, suggest the mode of foreign exchange risk management
  - Spot rate 1£ = 2.50/2.52ADs
  - 6 month forward rate: 1£ = 2.50/2.53ADs
  - Interest rate (£) 5-6% Interest rate AD = 6-7%

Answer

- Money market operations
  - The UK firm has a liability in foreign currency (5m Ads). The firm should create an asset of similar amount by purchasing Ads and investing for six months. The investment proceeds should be used for meeting the liability of 5m Ads
- Lets purchase Ads 5m/1.03 i.e. 4.8544m Ads
  - Invest this amount in ADs for six months
  - Investment proceeds = Ads 4.8544m (1.03) = ADs 5m
  - This amount should be used to meet the liability towards the Sydney based firm
  - The amount required for purchasing 4.8544m ADs = 4.8544m/2.50 = £1.94176m
  - The required amount (£1.94176m) for purchasing the ADs 4.8544 should be borrowed in £ at the rate of 6% p.a. for six months
  - Repayment after six months = £1.94176m(1.03) = £2m
- Forward: payment under forward = 5m/2.50 = £2.00m
- Though the cash outflow after six months is same in both the cases, yet forward is recommended as MMOs involve the risk of investing in ADs , there is no such risk in case of forward.

Question

- A British firm will have following two cash transactions after 2 months
- (i) cash payment for purchase of machinery $5,14,00
- (ii) cash receipts of dividend income $1,10,00
- Exchange data
  - Spot rate 1 £ = $1.6000/1.6050
  - 2 month forward 10/11 cents
- Interest rates (pound) 12% p.a.
- Two months maturity option data →
  - (lot size £ 25000)

Strike price $/£	Call	Put
1.55	1 cent	1. 2 cent
1.60	1.2 cent	1.3 cent
1.65	1.3 cent	1.4 cent
1.70	1.4 cent	1.6 cent
1.75	1.5 cent	1.75 cent

- Using the data given above, suggest the mode of foreign exchange risk management

Answer

- Forward
  - Purchase $4,04,000 on two month forward basis @ 1.70$/ £
  - Total cash outflow after 2 months under forward = 4,04,000/1.70 = £2,37,647.05
- Options:
  - The firm can sell £ on forward basis @ 1.70$. It should purchase the put options with strike price above 1.70$ only i.e. it should purchase put option with strike price of 1.75$/ £
  - No of £ to be sold for purchasing $4,04,000 after two months by purchasing the put option i.e. 4,04,000/1.75 = £2,30,857. the contract size of option is £25,000. the firm may purchase 9 contracts of put option with strike price of 1.75 $/£
  - Minimum realization on maturity = 225000 x 1.75 = $3,93,750
  - The firms requirement is $4,04,000. the remaining amount of $10,250 should be purchased on forward basis @ 1.70 $/£. Cost of purchasing $10,250 on forward basis = 10250/1.70 = £6029

- Put premium = 0.0175$ per £. Hence total premium is $3937.50. this amount can be purchased on spot basis for 3937.50/1.60 i.e. £2461
- Equivalent amount of put premium after 2 months = £2461(1.020) = £2510
- Total cash outflow under options
  - Amount to be paid under put £2,25,000
  - Cost of purchasing $10250 under forward £ 6,029
  - Equivalent amount of put premium £ 2,510 £2,33,539
- Settlement cash outflow, after 2 months, under each of two alternatives

Forward	Option
£2,37,647	£2,33,539

- Put option is recommended as the cash outflow after 2 months is minimum under the alternative. Our recommendation will be further strengthen if on maturity the spot price of the £ is greater than 1.75$/ £

Question

- XYZ, an Indian firm, will need to pay ¥5,00,000 on 30th June. In order to hedge the risk involved in foreign currency transaction, the firm is considering two alternative methods i.e. forward market cover and currency option contract
- On 1st April, following quotation (¥/Rs.) are made available
  - Spot 1.9726/1.9923 3 month forward 1.9726/1.9923
- The prices for forex currency option on purchase are as follows:
  - Strike price ¥2.125
  - Call option (June) ¥0.047
  - Put option (June) ¥0.098
- For excess or balance of ¥ covered, the firm would use forward rate as future spot rate
- You are required to recommend cheaper hedging alternative for XYZ ltd.

Answer

- Forward
  - 3 month forward rate = Re1 = ¥1.9726/1.9923
  - Applicable rate Re.1 = ¥1.9726
  - Amount payable under forward for purchasing 5,00,0000¥ = 5,00,000/1.9726 = Rs.2,53,473

- Put option (option to sell rupees against ¥
- Amount of rupees to be sold to get ¥5,00,000 = 5,00,000/2.125 = Rs.2,25,294
- Assuming the lot size be Rs.50,00, XYZ may buy put option to sell Rs.2,50,000 at 2.125
- Option premium = 2,50,000 x 0.098 = ¥24,500. this amount of ¥ may be purchased on spot for 24500/1.9156 i.e. Rs.12553
- Assuming that this amount is borrowed at 10% p.a. the cost of option premium will be 12,253(1.025) = Rs.12,867

- Cash flows on account of put option
  - Cost of option premium (-) 12,867
  - Getting 5,31,250¥ on exercising the put option (-)2,50,000
  - Selling excess ¥31,250 @ 1.9726 + 15,842
  - Total outflow 2,47,025
- Put option is recommended on account of lower amount cash outflow. Besides, if rupee rises at the time of maturity, the cost under put option will be less than Rs.2,47,025; in that case the option won't be exercised and ¥ will be purchased in the spot market.
  - *Note: suppose spot rate at the time of maturity is Re1 = ¥2.20. the option may not be exercised. 5,00,000¥ may be purchased in the spot market for Rs.5,00,000/2.20 i.e. 2,27,273. Total cost inclusive of cost of option premium will be 2,27,273 + 12,867 = Rs.2,40,140*

Purchasing Power parity Theory

- Exchange rates are affected by inflation. Higher rate of inflation in one country (as compared to the other country) results in discount of currency of that country and vice versa
- Example: suppose 1$ = Rs.45 (spot). Further suppose that one can purchase 1kg of X for Rs.45 in India or for 1$ in US. It means if we have 1$ we can purchase one kg of X good either in US or in India.
- Similarly, if we have Rs.45 we can purchase 1 kg of X either in India or in US
- Assume that inflation rate is 5% p.a. in US and 10% in India. Further assume that change in prices of X in the two countries is as per the inflation rates.
- Therefore, as per theory we can purchase 1 kg of X either in US or in India if we have $1.05. as the inflation rate in US is 5%. To purchase 1kg of X in India, we will require 49.50 as rate of inflation in India is 10%,
- Thus, if $1.05 = Rs.49.50 therefore 1$ = Rs.47.1429
- The theory assumes same real rate of interest for both the currencies.

Question

- One piece of parker pen costs £1 in UK and $1.70 in USA. Inflation rate is 10% p.a. in UK and 7% p.a. in USA. Assuming PPP holds good, find the expected foreign exchange rate after one year.

- Answer
  - Assuming PPT: spot £1 = 1.70$
  - Forward = £1(1.10) = 1.70$(1.07)
  - Therefore forward rate = £1 = 1.6536$

The fisher effect

- According to Prof. Fisher, the expected inflation rate for a country has an important effect on money interest rate (also referred as nominal interest rate) in the country. In other words, nominal rate of interest is affected by inflation rate.

- The Fisherian principal of interest rate is:
- (1 + real interest rate) + (1 + inflation rate) = (1 + nominal interest rate)

- Example
  - If real rate of interest is 10% and inflation rate is 20%, nominal rate of interest is 32%

Example

	Country A	Country B
Nominal interest rate	6%	8%
Inflation rate	2%	6%
Real interest rate	3.92%	1.887%

Interest rate parity theory (IRPT)

- IRPT states that exchange rate between currencies is directly affected by their interest rate differential.
- As per this theory, in free and efficient market, covered interest arbitrage is not possible.
- If interest rate of currency is higher, the currency will be at discount in future; the gain of higher rate will be set-off by loss on account of discount in currency value and vice versa.
- The term interest rate here refers to nominal interest rate
- Example
  - Let X and Y be two currencies. As per IRPT, whether you invest your money in X or Y on maturity your relative wealth will be same.

- As per IRPT the rate of discount/premium of currency can be calculated with the help of interest rate using formula:

- $rate\ of\ discount\ or\ premium\ of\ currency\ X\ (in\ comparison\ with\ currency\ Y = \frac{r_y - rx}{1+rx}$
  - Where r_x is interest of X currency, r_y is interest rate of y currency)

Question

- Spot 1$ = Rs.45.50
- Interest rate $ = 8% p.a.
- Interest rate (Rs.) = 12% p.a.

- Calculate
  a) estimated three months forward rate as per IRPT
  b) calculate rate of discount/premium of dollar on the basis of forward and spot rates
  c) calculate rate of discount/premium of dollars on the basis of interest rates.

Answer

- Spot rate
  - 1$ = Rs.45.50
  - Three months forward rate based on IRPT
  - $1(1.02) = Rs.45.50(1.03)
  - 1.02 = 46.865
  - 1$ = Rs.45.9461
- $Rate\ of\ premium\ of\ \$\ (three\ months) = \frac{45.9461-45.50}{45.50} \times 100 = 0.98\%$
- $Rate\ of\ premium\ of\ \$\ (three\ months) = \frac{0.03-0.02}{1+0.02} \times 100 = 0.98\%$

Question

	3 months	6 months	1 year
Dollar interest rate	6% p.a.	12% p.a.	?? p.a.
Chinese interest rate	8% p.a.	? p.a.	10% p.a.
Forward Yuan per $	?	?	7.52
Forward discount on yuan % per year	?	-2%	?

Spot 1$ = 7.50 Chinese Yuan. Complete the missing entries

answer

- Based on 3 months data:
  - Spot 1$ = 7.50CY
  - 3 month forward rate 1$(1.015) = 7.50(1.02)CY
  - Therefore 1$ = 7.5369CY
  - Rate of discount on Yuan per year = $\frac{\$Interest\ rate - CY\ Interest\ rate}{1+CY\ Interest\ rate} \times 100$
  - $= \frac{0.06-0.08}{1.08} \times 100 = 1.8519$

answer

- Based on 6 months data:
  - Spot 1$ = 7.50CY
  - 6 month forward rate 1$(1.06) = 7.50(1.07145)CY
  - Therefore 1$ = 7.5810CY
  - Rate of discount on Yuan per year = $\frac{\$Interest\ rate - CY\ Interest\ rate}{1+CY\ Interest\ rate} \times 100$
  - $-2.00 = \frac{0.12-CY\ Int\ Rate}{1+CY\ Int\ Rate} \times 100 =$
  - CY Interest rate = 14.29%

answer

- Based on 1 year data:
  - Spot 1$ = 7.50CY
    1CY = 0.1333$
  - 1 year forward rate 1$ = 7.52CY
    1CY = 0.1330$
  - % discount on CY per year = $\frac{forward\ price\ of\ CY - Spot\ price\ of\ CY}{spot\ Price\ of\ CY} \times 100$
  - $= \frac{0.1330-0.1333}{0.13333} \times 100 = -0.2251$
- $Rate\ of\ discount\ on\ CY\ per\ year = \frac{(\$Int\ rae - CY\ Int\ rate)}{1+CY\ Int\ rate} \times 100$
- $-0.2251 = \frac{\$Int.Rate - 0.10}{1+0.10} \times 100 = 9.75239\%$

Question

- Show co. a US firm sells goods to a wholesaler in Switzerland. The purchase price of the shipment is 50000CHFs with term of 90 days. Upon payment, shoe company will convert the CHF to $. The present spot rate for CHF/$ is 1.71, whereas the 90-day forward rate is 1.70. you are required to calculate and explain

i. If shoe company were to hedge its foreign exchange risk, what would it do? What transactions are necessary
ii. Is the CHF at a forward premium or at a discount
iii. What is the implied differential in interest rates between the two countries.

Answer

i. The shoe company should enter into a forward contract. Having entered into the contract, it will receive 50000/2.70 i.e. $29411.76 at the end of 90 days period.

ii. Spot 1$ = 1.71CHF

Forward 1$ = 170CHF

- $’s purchasing power (in terms of CHF) is decreasing
- i.e. $ is at forward discount
- It means CHF is at forward premium.

iii. Interest rate differential is just another name of premium or discount of one currency in relation to another currency. In this case, we are given the rates of $, we can calculate $ discount (as we are aware that $ is at discount as follows)

- $\$discount\ \%\ (90\ days) = \frac{1.70 - 1.71}{1.71} \times 100$ = 0.58479% or 1/171
- So interest rate differential for 90 days based on $ discount = 0.58479%

- Alternatively we could calculate implied interest differential as premium of CHF
  - Spot 1$ = 1.71 CHF →1CHF = $0.584795
  - Forward 1$ = 1.70 CHF →1CHF = $0.588235

- $CHF\ premium\ \%\ (90\ days) = \frac{0.588235 - 0.584795}{0.584795} \times 100 = 0.58824\%$

Question

- ABC co. have taken a 6 month loan from their foreign collaborators for USD 2 millions. Interest payable on maturity is a LIBOR plus 1%. Current 6 month LIBOR is 2%
- Enquiries regarding exchange rates with their bank elicit the following information:
- Spot $1 = Rs.48.5275
- 6 month forward = Rs.48.4575
- Questions:
  i. What would be their total commitment in rupees, if they enter into a forward contract?
  ii. What you advise them to do so? Explain giving reasons.

Answer

i. Interest for 6 months is (6/12) x (2% + 1%) i.e. 1.5%

$ payable after 6 months = ($2,000,000) x (1.015) = $2,030,000

Payable after 6 months in Rs. = 2,030,000 x 48.4575 = Rs.9,83,68,725

ii. Forward is advisable for following two reasons:

i. As per the question, the interest rate in US is 3%. We know that currently risk free interest in India is higher than this. As interest rate in US is substantially lower as compared to India, the $ is expected to be at premium (as per interest rate parity theory). Without forwards, this situation may result in loss to ABC.

ii. It is always advisable to play safe i.e. to cover all such huge risks which can be covered at an affordable cost.

Arbitrage opportunities

- Geographical arbitrage
  - Refers to a situation in which one currency is cheaper in one foreign exchange market and costlier in the other one.
  - A person may purchase the currency at lower rate in one market, may sell at the higher rate in the other market and make a profit.
  - *Arbitrage opportunities appear rarely and that too for a few moments only*

Question

- Spot rate (Switzerland) 1$ = 1.3689/1.3695 CHF
- Spot rate (US) 1CHF = 0.7090/0.7236$
- You have 1m CHF. What amount of profit can you make from arbitrage

- Answer
  - Switzerland 1CHF = 0.7302/0.7305$
  - USA 1CHF = 0.7090/0.7236$
  - Sell 1m CHF in Switzerland @.7302 and get $7,30,200. now sell these $ at USA and get 7,30,200/0.7236 i.e. 10,09,121 CHF.
  - Profit due to arbitrage = 9121 CHF

Question

- Singapore Spot 1$ = 1.3689/1.4150 CHF
- New York Spot 1CHF = 0.7090/0.7236$
- Can you make profit through arbitrage?

- Answer
  - Singapore spot 1$ = 1.3689/1.4150CHF
  - Singapore spot 1CHF = 0.7067/0.7305$
  - New York spot 1$ = 1.3820/1.4104CHF
  - New York spot 1CHF = 0.7090/0.7236$
- No arbitrage opportunity in all the cases

Question

- You sold Hong Kong Dollar 1.00 crore on spot to your customer at Rs.5.70 and covered yourself in London market on the same date, when the exchange rate were:
  - 1$ = HK$7.5880/7.5920

- Local inter bank market rates for $ were
  - Spot 1$ = Rs.42.70/42.85

- Calculate the cover rate & ascertain the profit/loss in the transaction. Ignore brokerage.

Answer

- To cover the sale, you have to purchase HKD1,00,00,000 using the sale proceeds of the HKD. Cover rate here means the rate which we shall be purchasing HKD i.e. the rate at which the bank will be selling HKD, i.e. the ask rate of HKD in terms of rupees
  - 1$ = 7.5880-7.5920HKD i.e. (HKD/USD)
  - 1HKD = 1/7.5920-1/7.5880$ i.e. (USD/HKD)
  - 1$ =Rs.42.70 – 42.85 i.e. (Rs/$)
  - 1Re. =1/42.85 – 1/42.70 $ i.e. ($/Rs.)
  - Therefore Re/HKD = (Rupees/$) x ($/HKD)
  - Rupees/HKD (ask) = 42.85 x (1/7.5880) = 5.6471
  - 1 HKD = Rs.5.6471
- Sale proceeds of 1,00,00,000 HKD = Rs.5,70,00,000
- Cost of 1,00,00,000 HKD = Rs.5,64,71,000
- Profit = Rs.5,29,000

Question

- You, a foreign exchange dealer of your bank, are informed that your bank has sold a TT on Copenhagen for Danish Kroner 10,00,000 at the rate of Danish Kroner 1 = Rs.6.5150. You are required to cover the transaction either in London or New York market. The rates on that date are as under:

• Mumbai – London	Rs.74.3000	Rs.74.3200
• London – New York	Rs.49.2500	Rs.49.2625
• London – Copenhagen	DKK11.4200	DKK11.4350
• New York – Copenhagen	DKK07.5670	DKK07.5840

- In which market you cover the transaction, London or New York, and what will be the exchange profit or loss on the transaction? Ignore brokerages.

Answer

- To cover the transaction, we have to purchase DK 10,00,000. DK can be purchased either through £ or through $
- Through £
  - 1£ = DKK11.4200-11.4350
  - Number of pounds required to purchase DK 10,00,000 = 10,00,000/11.4200 = £87,565.67
  - 1£ = Rs.74.3000 – 74.3200
  - The required amount of £ can be purchased for Rs.74.32 x 87565.67 = Rs.65,07,881
- Through $
  - 1$ = DKK7.5670 – 7.5840
  - Number o $ required to purchase DK10,00,000 = 10,00,000/7.5670 = $1,32,152.77
  - 1$ = Rs.49.2500 – 49.2625
- The required amount of $ can be purchased for Rs.49.2625 x 1,32,152.77 = Rs.65,10,176
- The transaction may be covered through £ at London. The profit will be:
  - Sale proceeds 10,00,000DK = 65,15,000
  - Cost of purchase of 10,00,000DK = 65,07,881
  - Profit = Rs.7119

Question

- A person borrowed $1,00,000 @ 8% for three months, converted the dollars in rupees at spot rate 1$ = Rs.46.70/46.80. invested the dollar proceed (i.e. rupees) @ 12% p.a. for three months. Purchased $1,02,000 on 3 months forward basis of 1$ = 46.75/46.86. what is the gain/loss? Assume no loss of time in any transaction.

- Answer
  - Receipt after 3 months 46,70,000 (1.03) = Rs.48,10,100
  - Payment after 3 months 1,02,000 x 46.86 = Rs.47,79,720
  - Gain = 48,10,100 – 47,70,720 **= Rs.30,380**

Covered interest arbitrage

- It is the process of taking advantage of interest rate differentials.
- In this process investment is made in that currency with higher rate of interest.
- Exchange risk is covered through forward contracts.

Question

- Spot 1$ = Rs.47.00/47.20
- 3 months forward 1$ = Rs.47.50/47.70
- Interest rates = Rs.8% p.a.; $5%p.a.
- Is there opportunity for covered interest arbitrage

- Answer
  - Covered interest arbitrage: let us borrow $1,00,000. convert into Rs.47,00,000. Invest @ 8% p.a. for 3 months. Repayment along with interest after 3 months = $1,01,250. enter into forward purchase contract of $1,01,250 @ Rs.47.70

  i. Receipt after 3 months = 47,00,000 (1.02) = Rs.47,94,000
  ii. Payment after 3 months = 1,01,250 x 47.70 = Rs.48,29,625
  iii. Loss = Rs.35,625

- There is no opportunity for covered interest arbitrage

Question

- Given the following information:
- Exchange rate
  - Canadian dollar 0.665 per DM (spot)
  - Canadian dollar 0.670 per DM (3 months forward
- Interest rate
  - DM7% p.a. & CD 9%p.a.

- What operation would be carried out to take the possible arbitrage gain?

Answer: If we borrow DM and invest in CD

- Savings on account of interest = (9 – 7) x (3/12) = 0.50%

- In this case we have to purchase DM by paying CD after three months from today. DM is at premium. This is cost for us

$$premium\ of\ DM = \frac{0.670 - 0.665}{0.665} \times 100 = 0.75\%$$

- Saving (in terms of interest) is less than cost (in terms of DM premium), borrowing DM and investing in CD will result in loss

- Now let us borrow in CD and invest in DM
- Suppose we borrow 1,000 CD at interest rate of 9%
- Total amount payable after 3 months 1022.50 CD. Enter into a forward purchase contract of 1022.50 CD @1.4925 DM per CD
- Covert borrowed 1,000 CD into 1503.76 DM
- Invest in DM at interest rate of 7%. Investment proceeds = 1503.76 (1.0175) = 1530.08
- Cost of buying 1022.50CD on forward basis = 1022.50 x 1.4925 = Rs.1526.08
- Arbitrage profit = 1530.08 – 1526.08 = DM4

- If the question does not mention the currency in which the arbitrage gain is to be calculated, we should calculate the same in the home currency.

- In this question, we don not know the home currency; we may calculate the same either in DM or in CD.

- In the answer given above, we have calculated the profit in DM.

- Alternatively we may calculate the arbitrage in terms of CD

- Now let us borrow in CD and invest in DM
  - Suppose we borrow 1000 CD at interest rate of 9%
  - Total amount payable after 3 months 1022.50CD
  - Convert into 1503.76 DM on spot basis. Invest in DM at interest rate of 7%
  - Investment proceeds = 1503.76 (1.0175) = 1530.08DM
  - Convert this amount into CD on forward basis. 1530.08 x 0.670 = 1025.15CD
  - Arbitrage profit 1025.15 – 1022.50 = 2.65CD

Question

- Spot rate 1$ = Rs.48.0123
- 180 days forward rate 1$ = Rs.48.8190
- Annualized rate for 6 months – Rupees 12%
- Annualized rate for 6 months - $ 8%
- Is there any arbitrage possibility? If yes, how can the arbitrageur take advantage of the situation, if he is willing to borrow Rs.40,00,000 or $83,312.

Answer

- If we borrow in $ and invest in Rupees
  - Savings on account of interest = (12 – 8) x (6/12) = 2%
  - In this case we have to purchase $ by paying rupees after six months from today. $ is at premium. This is cost for us
  - $premium\ of\ \$ = \frac{48.8190 - 48.0123}{48.0123} \times 100 = 1.68\%$
  - Savings (in term of interest) is more than cost (in terms of $ premium), thus, borrowing $ and investing in rupees will result in profit
- Proof
  - Borrow 83,312$
  - Total amount payable after 6 months = 83,312(1.04) = 86,644.48
  - Enter into forward contract of purchasing 86,644.48 x 48.8190 = Rs.42,29,897
  - Convert 83,312$ into rupees at spot i.e. 83,312 x 48.0123 = Rs.40,00,000
  - Invest in rupees i.e. @ 12% for six months = 40,00,000 (1.06) = 42,40,001
- Thus arbitrage profit 42,40,0001 – 43,29,897 = Rs.10,104

Question

- Spot 1$ = Rs.47/47.20
- 3 month forward 1$ = Rs.47.50/47.70
- Interest rates = Rs.8% p.a. and $ 5% p.a.
- Is there any opportunity for covered interest arbitrage? Is their arbitrage opportunity

Answer

- Covered interest arbitrage: let's borrow $1,00,000. convert into Rs.47,00,000. Invest @ 8% p.a. for 3 months. Repayment amount along with interest after 3 months = $1,01,250. enter into forward purchase contract of $1,01,250@ 47.70
  - Receipt after 3 months = 47,00,000 (1.02) = Rs.47,94,000
  - Payment after 3 months = 1,01,250 x 47.70 = Rs.48,29,625
  - Loss = Rs.35,625
    - There is no opportunity for covered interest arbitrage
- Arbitrage opportunity:
  - Let us borrow Rs.47,20,000 and covert into 1,00,000$ on spot and invest @5% p.a. for 3 months. Thus investment proceeds 100000$(1.0125) = $1,01,250.
  - Enter into forward contract for selling 1,01,250$ after 3 months @ 47.50 and receive Rs.48,09,375
  - Repayment of rupee borrowing along with interest = 47,20,000 x (1.02) = Rs.48,14,000
  - Loss = Rs.5,025
    - There is no arbitrage opportunity

Leading and Lagging

- Leading means advancing a payment i.e. making a payment before it is due.

- Lagging involves postponing a payment i.e. delaying payment beyond its due date.

- Leading and lagging are used for two purpose
  - To hedge foreign exchange risk
  - To shift the liquidity by modifying the credit terms between inter group entities.

To hedge foreign risk

- A company can lead payments required to be made in a currency that is likely to appreciate.
- Example
  - A company has to pay $10,000 after one month from today,. The company apprehends, the USD to appreciate. It can make the payment now.
  - Leading involves a finance cost i.e. one months interest cost of money used for purchasing $10,000.
  - Suppose a London based firm has to pay $60,000 to a New York firm after two months from today.
  - Spot exchange rate is 1£ = 1.50$. The London firm apprehends the $ to appreciate considerably.
  - It can pay 60,000$ to New York firm now, instead of in to months time.
  - $60,000 will cost £40,000 in the spot market.
  - The cost of this lead payment would be interest cost of borrowing £40,000 for two months at company's borrowing cost or its opportunity cost of capital.
  - The cost of leading may be reduced if the receiver allows some discount on account of early payment (i.e. leading may be profitable proposition if the amount of discount, converted into £ is more than finance cost of leading.

- A company may lag the payment that it needs to make in a currency that it is likely to depreciate, provided the receiving party agrees for this proposition.
- The receiving party may demand interest for this delay and that would be the cost of lagging
- Decision regarding leading and lagging should be made after considering
  - Likely movement in exchange rate
  - Interest cost
  - And discount if any

To shift the liquidity by modifying the credit terms between inter group entities:

- A holding company sells goods to its 100% subsidiary. Normal credit term is 90 days. Suppose cost of funds is 12% for Holding and 15% for subsidiary.
- In this case the holding may grant credit for longer period to subsidiary to get the best advantage for the group as a whole.
- If cost of funds is 15% for holding and 12% for subsidiary, the subsidiary may lead the payment for the best advantage of the group as a whole.
- The decision regarding leading and lagging should be taken on the basis of cost of funds to both paying entity and receiving entity.
- If paying and receiving entities have different home currencies, likely movements in exchange rate should also be considered

Question

- An Indian firm has imported a machine from USA, the invoice is $1,00,000. the payment is to be made in 2 months time. The USD rates are quoted in the market as follows: Spot 1$ = Rs.45.00/45.05

- 2 months forward 1$ = Rs.45.30/45.36

- The importer firm is considering the leading. It can borrow rupees in India at the rate of 9% p.a.
  a) Opine
  b) Will your opinion change if the exporter allows a discount of 1% on immediate payment?

Answer

- For leading the payment, the firm has to borrow Rs.45,05,000
  - Cash outflow after 2 months without leading Rs.45,36,000
  - Cash outflow after 2 months with leading Rs.45,05,000(1.015)
    = Rs.45,72,575
- For leading the payment, the firm has to borrow Rs.44,59,950
  - Cash outflow after 2 months without leading Rs.45,36,000
  - Cash outflow after 2 months with leading Rs.44,59,950(1.015)
    = Rs.45,26,849.25
- Leading is not recommended in case of (a)
- Leading is recommended in case of (b)

Question

- An Indian firm has imported a machine from USA, the invoice is $1,00,000. the payment is to be made in 2 months time. The USD rates are quoted in the market as follows:
- 2 months forward 1$ = Rs.45.30/45.36
- 3 months forward 1$ = Rs.44.80/44.85

- The importer firm is considering the lagging. The exporter firm will charge interest at the rate of 9% p.a. if the payment is delayed after it becomes due. Your cost of capital is 12%
- Opine?

Answer

- PV of cash outflow – without lagging – Rs.45,36,000 x (1/1.02) = Rs.44,47,059

- PV of cash outflow – with lagging – 1,00,750 x 44.85 x (1/1.03) = Rs.43,87,027

- Lagging is recommended

Question

- Z ltd. importing goods worth $2m requires 90 days to make the payment. The overseas supplier has offered a 60 days interest free credit period and for additional credit for 30 days at an interest of 8% p.a. the bankers of Z ltd. offer a 30 day loan at 10% p.a. and their quote for foreign exchange is as follows

- Spot 1$ 56.50
- 60 days forward for 1$ 57.10
- 90 days forward for 1$ 57.50
- You are required to evaluate the following options
- (i) pay the supplier in 60 days
- (ii) avail the supplier’s offer of 90 days credit

Answer

- (i)
  - Borrow Rs.57.10 x 2m — Rs.11,42,0,000
  - Interest for one month on rupee = (10/12)/100 — 0.008333333
  - Repayment after 30 days (from the date of borrowing = Rs,11,42,000 x (1.008333333) = Rs.11,51,51,667

- (ii)
  - Interest for one month on Dollar — (8/12)/10 = 0.006666666
  - Payment after 30 days of additional credit: — $20,00,000(1.006666666) = 2013,333.33
  - Payment after 30 days of additional credit — 2013,333.33 @ Rs.57.5/$ = Rs.11,57,66,667

Foreign exchange risk exposure

- Changes in foreign exchange rates affect the value of a firm on account of
  - Change in the value of its assets and liabilities denominated in foreign currency
  - Revenues and expenses that have been expressed in foreign currency will result in either foreign exchange gain or loss

- Change in currency rates may have substantial effect on some firms (in case of firms engaged in international transactions or/and having foreign operations that are most affected by the changing currency exchange rates), it may have quite minimum effect on the others.

- It is unlikely that in today's world any business firm is immune from the effects of changes in foreign currency rates.

- Degree of financial effects to a firm on account of fluctuations in foreign exchange rates, is termed as foreign exchange risk exposure.
- Foreign exchange exposure is defined as sensitivity of changes in the value of the firm on account of changes in foreign exchange rates
- Foreign exchange exposure is divided into 3 parts
  - Transactions
  - Translations
  - economic

- Transaction exposure
  - Is concerned with gain/loss arising out of foreign exchange rate fluctuations on account of outstanding payables and receivables in foreign currency.
  - Suppose an Indian firm has to pay $1,00,000 after six months from today and the rate of $ rises the firm will suffer loss and vice versa
  - To hedge against these type of exposures, some foreign exchange risk measures like forwards may be used

- Translation exposure
  - Firms having foreign operations like foreign branch, foreign associate, foreign joint venture, foreign subsidiary etc. have to convert the financial statements of these operations (in local currency) for incorporating/ consolidating them in the financial statements of these firms.
  - For this purpose, the firm follow (AS-11) (revised 2003).
  - The net result of this process results in gain/loss and thereby affects the value of the firm.

- Economic exposure/ operating exposure
  - It arises because of the changes in foreign exchange rates that affect non-contractual future transactions.
  - Suppose a firm is establishing a subsidiary in a foreign country which is selling the goods produced by the firm in that country, it estimates that a large quantity will be sold at attractive prices.
  - Suppose, the currency of the country (in which subsidiary operates) depreciates and the market is not in position to absorb the increase in price, future income of the firm, also future cash flow will be reduced.
  - In other words, it is defined as change in operating profit due to change in selling price (on account of change in foreign exchange rate.)
  - Hence, the company should plan its reaction to exchange rate changes before it makes an investment

Question

Following are the details of cash inflows and outflows in foreign currency of an Indian Export firm, Which have no foreign subsidiary:

Currency	Inflow	Outflow	Spot rate	Forward rate
$	4,00,00,000	2,00,00,000	48.01	48.82
French Francs	2,00,00,000	80,00,000	7.45	8.12
UK pound	3,00,00,000	2,00,00,000	75.57	75.98
Japanese Yen	1,50,00,000	2,50,00,000	3.20	2.40

Determine the net exposure of each of foreign currency in term of rupees

Answer

Currency	Net cash flow	Changes in the value of the firm (Rupees)
USD	+2,00,00,000	2,00,00,000(48.82 – 48.01) = 1,62,00,000
FF	+1,20,00,000	1,20,00,000(8.12 – 7.45) = 80,40,000
Pound	+1,00,00,000	1,00,00,000(75.98 – 75.57) = 41,00,000
Yens	-1,00,00,000	-1,00,00,000(2.40 – 3.20) = 80,00,000
		Total Rs3,63,40,000

The foreign exchange exposure has increased the value of the firm by Rs.3,63,40,000

Question

- M/s Omega electronics ltd. exports air conditioners to Germany by importing the components from Singapore. The company is exporting 2400 units at a price of Euro 500 per unit. The cost of imported components is $800 per unit. The fixed cost and other variable cost per unit are Rs.1000 and Rs.1500 respectively. The cash flows in foreign currencies are due in six months. The current exchange rates are as follows:
  - Rs/Euro 51.50/55
  - Rs/$ 27.20/25
- After six months the exchange rates turn out as follows
  - Rs./Euro 52.00/05
  - Rs./$ 27.70/75
- (i) you are required to calculate the gain/loss due to transaction exposure
- (ii) based on the following additional information calculate the loss/gain due to transaction and operating exposure if the contracted price of the air conditioner is Rs.25,000
  - (i) the currency exchange rate is Rs/Euro 51.75/80 and Rs./$ 27.10/15
  - (ii) price elasticity of demand is estimated to be 1.5
  - (iii) payment and receipts are to be settled in six months

Answer

- Profit/loss on Euro
  - Receivable at the time of export :2400x500x51.50 Rs.6,18,00,000
  - Actual :2400x500x52.00 Rs.6,24,00,000
  - Gain on Euro Rs.6,00,000
- Profit/loss on $
  - Payable at the time of import :2400x800x27.25 Rs.5,23,20,000
  - Actual payment :2400x800x27.75 Rs.5,32,80,000
  - Loss on $ Rs.9,60,000
- Total gain/loss on account of transaction exposure = (Rs.3,60,000)

- Operating exposure (change in profit due to change in demand)
- Operating profit on the date of transaction (selling price Euro 500)
  - Sale — Rs.6,21,00,000
  - Cost
    - Fixed Cost — Rs.24,00,000
    - Variable cost — Rs.36,00,000
    - Cost of import(2400x800x27.15) — Rs.5,21,28,000
  - Total cost — Rs.5,81,28,000
  - Profit — Rs.39,72,000

- New scenario (selling price Rs.25,000)
- Selling price in Euro (to be paid by the German Customer) 25,000/51.75 = 483.09 Euro
- $\%change\ in\ selling\ price = \frac{16.91}{500} \times 100 = 3.382\%$
- Elasticity of demand = 1.5
- Hence, the demand will go up by 3.382 x 1.5 = 5.073%
- Demand with new price = 2400 x (105.073/100) = 2522
- Operating profit on the date of transaction (selling price Rs.25,000):
  - Sale (25000 x 2522) — Rs.6,30,50,000
  - Cost:
    - Fixed cost (assuming no change) — Rs.24,00,000
    - Variable cost 92522 x 1500) — Rs.37,83,000
    - Cost of import — Rs.5,47,77,840
    - Total cost — Rs.6,09,60,840
  - Profit — Rs.20,89,160
- **loss due to operating exposure: Rs.39,72,000 – 20,89,160 = Rs.18,82,840**

- Transaction exposure
  - Profit/loss on $

• Payable at the time of import:	:2522x800x27.15	Rs.5,47,77,840
• Actual payment	:2522x800x27.75	Rs.5,59,88,400
• Loss on $		Rs.12,10,560

International Working Capital Management - question

- AMK ltd. an India based company, has subsidiaries in US and UK
- Forecasts of surplus funds for the next 30 days from two subsidiaries are as below: US$12.5m and UK £6m
- Following exchange rate information are obtained:

	$/Rs.	£/Rs.
Spot	0.0215	0.0149
30 days forward	0.0217	0.0150

- Annual borrowing/deposit rates (simple) are available
  - Rs. 6.4%/6.2%
  - $ 1.6%/1.5%
  - £ 3.9%/3.7%
- The Indian operation is forecasting a cash deficit of Rs.500m
- It is assumed that interest rates are based on a year of 360 days

i. Calculate the cash balance at the end of 30 days period in Rs. For each company under each of the following scenarios ignoring transaction costs and taxes

   i. Each company invest/finances its own cash balances/deficits in local currency independently
   ii. Cash balances are pooled immediately in India and the net balances are invested/borrowed for the 30 days period

- Which method do you think is preferable from parent company's point of view.

Answer

- Scenario I
- Interest rate per monetary unit, for 1 month
  - Re 0.005333/0.005167
  - $ 0.001333/0.001250
  - £ 0.003250/0.003083
- Cash balances at the end of 30 days period under Alternative I
  - US - $12.50m (1.001250) = $12.515625m((+balance) Rs.576.7569m
  - UK - £6m (1.003083) = £6.018498 (+ balance) Rs.401.2332m
  - India Rs.500m(1+0.0053333) = Rs.502.6665m (deficit) Rs.502.6665m
- TOTAL Rs.475.326m

- Scenario II
- The parent company receives $12.50m and £6m from subsidiaries, converts into rupees on spot rate basis. The parent company returns $12.515625 to US subsidiary £6.018498 to UK subsidiary by purchasing these currencies on forward basis. (these amounts are inclusive of interest at deposit rates, which otherwise the subsidiaries would have earned by investing in their respective currencies.

• Parent company	Rs.(million)
• Cash position opening	-500
• Receipt from US subsidiary $12.5m/.0215	+581.3953
• Receipt from UK subsidiary £ 6m/.0149	+402.6846
• Investment	484.0799
• Investment proceeds after 30 days	486.5811
• Payment of $12.515625m(purchase on forward basis)	-576.7569
• Payment of £6.018498m (purchase on forward basis)	-401.2332
• Deficit at the end of 30 days period	491.4090

- Cash balances at the end of 30 days period under alternative II

• US	$12.50m(1.001250) = $12.515625 (+balance)	Rs.576.7569m
• UK	£6m(1.003083) = £6.018498 (+balance)	Rs.401.2332m
• India	Rs.49.4090m (deficit) =	Rs.491.4090m
• Total		Rs.486.5811m

- Immediate cash pooling is recommended

Question

- Your bank's London office has surplus funds to the extent of $5,00,000 for a period of 3 months. The cost of the funds to the bank is 4%. It proposes to invest these funds in London, New York or Frankfurt and obtain the best yield, without any exchange risk to the bank. The following rates of interest are available at the three centers for investment of domestic funds there at for a period of 3 months.
- London 5% p.a.; New York 8% p.a.; Frankfurt 3% p.a.
- The market rates in London for USD and Euro are as under:

London on New York	London on Frankfurt
Spot: 1.5350/90	Spot 1.8260/90
1 month 15/18	1 month 60/55
2 months 30/35	2 months 95/90
3 months 80/85	3 months 145/140

At which centre, will the investment be made & what will be the net gain (to the nearest pound) to the bank on the invested funds?

Answer: it is assumed that the cost of funds is 4% p.a. It is the cost of funds in terms of $ i.e. after three months the bank has to pay $5,05,000

- Investment at London
  - Spot Rate: 1 £ = $1.5350/1.5390
    - Sell $5,00,000 on spot @ 1.5390 to get £3,24,886.29
    - Invest £3,24,886.29 @ 5% p.a. for 3 months. Investment proceeds £3,28,947.84
  - 3 months forward rate:
    - 1 £ = $1.5430/1.5475
    - Buy 3 months forward $5,05,000 @ 1.5430 i.e. for £3,27,284.51
  - Profit = investment proceeds minus cost of forward purchase = £1663.3

- Investment at New York
  - Investment proceeds $5,10,000 Profit $5000
  - 3 months forward rate:
  - 1£ = 1.5430/1.5475
  - Sell $5000 on forward @ 1.5475 i.e. for £3231.02
  - Profit £3232.02

- Investment at Frankfurt
  - Spot rate 1£ = 1.5350/1.5390
  - Sell $5,00,000 on spot @ 1.5390 to get £3,24,886.29
  - Spot rate: 1£ = €1.8260/1.8290
  - Sell £3,24,886.29 on spot @ 1.8260 to get €5,93,242
  - Invest €5,93,242 @ 3% p.a. for 3 months. Investment proceeds €3,29,306.51
  - 3 month forward rate 1£ = €1.8115/1.8150
  - Sell 3 months forward €5,97,691.32 @ 1.8150 i.e. to get £3,29,306.51
  - 3 month forward rate 1£ = $1.5430/1.5475
  - Buy 3 months forward $5,05,000 @ 1.5430 i.e. for £3,27,284.51
- Profit = sale proceeds of Euro forward minus purchase of $ forward
  - £3,29,306.51 - £3,27,284.51 = £2,022

- Investment in New York is recommended on account of maximum amount of profit in terms of pounds.

Question

- An Indian firm wants to take advantage of some short term business opportunity in France and for this purpose the firm needs Euro for four months. The firm can borrow the required funds either in Rupees or in Euros. The following foreign exchange rates are prevailing in the market.
- Spot 49.95/50.00
- 4 months forward rate 50.00/50.05
- The interest rates prevailing in the market
  - 2 months Rs.12%p.a. Euro 6% p.a.
  - 4 months Rs.11.40p.a. Euro 6.60%p.a
- Advise the firm whether it should borrow in rupees or in Euros
- Determine 2 months interest rate after 2 months from today that will make the firm indifferent between 4 months borrowing and borrowing for 2 months and again borrowing for 2 months. Give your answer for rupee borrowing. Also for euro borrowing.

Answer

- Net outflow after 4 months
  - Euro borrowings 1,00,000(1.022) x 50.05 = Rs.51,15,110
  - Rs. Borrowings 50,00,000 (1.038) Rs.51,90,000
  - Euro borrowing is recommended
- Rupee interest for next 2 months after first 2 months so that the borrower may be indifferent between “4 months borrowings” and “2 months borrowings” and again 2 months borrowings”
  - let the interest rate for next 2 months borrowings (for 2 months) = r
  - (1.02)(1+r) = 1.038
  - r = 0.0176 = 1.76%
  - Annual rate = 1.76(12/2) = 10.56%
- Euro interest for next 2 months after first 2 months so that the borrower may be indifferent between “4 months borrowings” and “2 months borrowings and again 2 months borrowings”
  - Let the interest for next 2 months borrowing (for 2 months) = r
  - (1.01) (1+r) = 1.022r = 0.0119 = 1.19%
  - Annual rate = 1.19 x (12/2) = 7.14%

Question

- A UK company has its subsidiaries in three countries – India, USA and south Africa. At the end of the year the inter company balances were as follows
  - The Indian subsidiary owed Rs.14m by the south African subsidiary
  - Indian subsidiary owes $1m to US subsidiary
  - South African subsidiary is owned 1.40m south African Rands (R) by the US subsidiary
  - South African subsidiary owes $1m to US subsidiary.
- The foreign currency rates are 1pound = 2$ = Rs.70 =10R
- The holding company instructed the subsidiaries to settle the balances on net basis. Assuming that the statutes of all the companies permit this type of settlement, what the different subsidiaries will do?

Answer

	Indian Subsidiary	USA subsidiary	S. Africa Subsidiary
Indian subsidiary vs. south African Subsidiary	+£0.20m		- £0.20m
Indian subsidiary vs. subsidiary	- £0.20m	+£0.50m	
South African subsidiary vs US subsidiary		- £0.14m	+£0.14m
		+£0.50m	-£0.50m
Net receivable		+£0.86m	
Net payable	+£0.30m		+£0.56m

- Indian subsidiary should pay the USA subsidiary $0.60m
- South African subsidiary should pay the USA subsidiary $1.12m

General problems on Foreign Exchange Risk Management

Question

- The currency of country x is x mark and that of country Y is y frank. Using the data given below, estimate 1 year, 2-year, 3-year forward rates of X mark assuming that the x mark appreciated @ 6% p.a. in real terms.

- Spot rate – 1 x mark = 2 y franks
- Inflation rate 5% p.a. in country x and 7%in country Y

Answer

- Spot rate 1x mark = 2y franks
- 1 year forward rate
  - Considering only inflation
    - 1 x mark (1.05) = 2 y franks (1.07)
    - 1 x mark = 2.0381 y franks
  - Considering the real appreciation:
    - 1 x mark = 2.0381 (1.06) y franks = 2.1604 y franks
- 2 year forward rate
  - Considering only inflation
    - 1 x mark (1.05) = 2.1604 y franks (1.07)
    - 1 x mark = 2.2016 y franks
  - Considering the real appreciation:
    - 1 x mark = 2.2016 (1.06) y franks = 2.3337 y franks
- 3 year forward rate
  - Considering only inflation
    - 1 x mark (1.05) = 2.3333 y franks (1.07)
    - 1 x mark = 2.3782 y franks
  - Considering the real appreciation:
    - 1 x mark = 2.3782 (1.06) y franks = 2.5209 y franks

Question

- Following are the spot exchange rates quoted in three different forex markets:
  - USD/INR 48.30 in Mumbai
  - GBP/INR 77.52 in London
  - GBP/USD 1.6231 in New York

- The arbitrageur has USD 1,00,00,000. assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates

Answer

- The rates given in the question have been interpreted as follows:
- 1$ = Rs.48.30 1£ = Rs.77.52 1£ = 1.6231$

- The rate of $ is Rs.48.30 in Mumbai. It is 77.52/1.6231 i.e. Rs.47.7605 in international market. Sell $ in India and buy $ in international market.
  a) Sell $ 1,00,00,000 for Rs.48,30,00,000
  b) To buy 1,00,00,000$, the arbitrageur requires 1,00,00,000/1.6231 i.e. 61,61,050£
  c) Buy the required amount of £ for 61,61,050 x 77.52 i.e. Rs.47,76,04,596
  d) Profit Rs.53,95,404

Question: an importer booked a forward contract with his bank on 10th April for $2,00,000 due on 10th June @Rs.64.4000. the bank covered its position in the market at Rs.64.2800. the exchange rates for $ in the interbank market on 10th June and 20th June were

	10th June (Rs.)	20th June (Rs.)
Spot USD 1	63.8000/8200	63.6800/7200
Spot June	63.9200/9500	63.8000/8500
July	64.0500/0900	63.9300/9900
August	64.3000/3500	64.1800/2500
September	64.6000/6600	64.4800/5600

Exchange margin 0.10% and interest on outlay of funds @ 12%. The importer requested on 20th June for extension Of contract with due date on 10th August. Rates rounded to 4 decimal in multiples of 0.0025.
On 10th June, Bank swaps By selling spot and buying one month forward.
Calculate (i) cancellation rate (ii) amount payable on $2,00,000 (iii) swap loss (iv) interest on outlay of funds, if any (v) New contract rate (vi) total cost

Answer

- (a) We are given two spot rates

		10th June	20th June
A	Spot USD 1	Rs.63.8000/8200	Rs.63.6800/7200
B	Spot June	Rs.63.9200/9500	Rs.63.8000/8500

The first rate i.e. A has ben used for solving the question
(b) Forward rates as on 10th June, given against July are for 10th July
(c) Forward rates as on 20th June, given against August are for 20th August

Main Answer

- (i)
- 10th April
  - Under original contract, the customer shall be buying (the bank shall be selling) $2,00,000 @ Rs.64.40 due 10th June
- 20th June
  - For cancelling the original contract, the bank shall be buying (the customer shall be selling) $2,00,000 on spot on 20th June.
- Spot rate in inter bank market Rs.63.6800
- (-) margin Re.00.0637
- Cancellation rate Rs.63.6163 (say 63.6175)

- (ii)
  - Customer buying rate (as per original contract rate) Rs.64.4000
  - Customer selling rate for cancellation Rs.63.6175
  - Loss to customer per $ Re.00.7825
  - Amount payable on $2,00,000 Re.0.7825x2,00,000=Rs.1,56,500
- (iii)
  - Swap transactions are entered by banks for hedging their risk. For such transactions, the bank is customer and interbank market is just like bank. No margin is considered for such transactions. Swap transactions on 10th June:
    - Bank buys one month forward @ Rs.64.09
    - Bank Sells spot @ Rs.63.8000
    - Swap loss to bank (customer has to bear it) Re.0.29 per $
    - Swap loss = 2,00,000 x 0.29 = Rs.58,000

- (iv)
  - Bank buys @ Rs.64.28
  - Bank sells @ Rs.63.80
  - Outlay per $ = Rs.0.48
  - Total outlay Rs.96,000
  - Interest on Rs.96,000 for 10 days (from 10th June to 20th June) @ 12% p.a. = 96,000 x 10/365 x 0.12 = Rs.316
- (v)
  - new contract rate 64.2500 + margin = Rs.64.31425 (say 64.3150)
- (vi)
  - Total cost
  - = cost at new contract rate + loss on cancellation + swap loss + interest
  - = 2,00,000 x 64.3150 + 1,56,500 = 58,000 + 315 = Rs.1,30,77,815

Practice question

Following information relates to AKC ltd. which manufactures some part of an electronics Device Which are exported to USA, Japan & Europe on 90 days credit terms. The cost and sales information Are as follows:

	Japan	USA	Europe
Variable cost / unit	Rs.225	Rs.395	Rs.510
Export price/ unit	Yen 650	$10.23	€11.99
Receipt from sales due in 90 days	Yen 78,00,000	$1,02,300	€95,920
Foreign exchange rate information	Yen/Rs.	$/Rs.	€/Rs.
Spot	2.417 – 2.437	0.0214 – 0.0217	0.01770/0.0180
3 month forward	2.397 – 2.427	0.0213 – 0.0216	0.0176/0.0178
3 month spot	2.423 – 2.459	0.02144 – 0.02156	0.0177/ 0.0170

Advice AKC ltd. by calculating average contribution to sales ratio whether
It should hedge its foreign currency risk or not

Answer

Working note number 1

	No. of units exported	VC/units (Rs.)	Total VC
Japan	78,00,000/650 = 12,000	225	27,00,000
US	1,02,300/10.23 = 10000	395	39,50,000
Europe	95,920/11.99 = 8000	510	40,80,000
			1,07,30,000

Working note number 2

		Hedging		No Hedging	
	Sale Proceeds	Foreign exchange rate	Sale proceeds	Foreign exchange rate	Sale proceeds (Rs.)
Japan	¥78,00,000	2.427¥/Re	32,13,844	2.459¥/Re	31,72,021
USA	$1,02,300	0.0216$/Re	47,36,111	0.02156$/Re	47,44,898
Europe	€95,920	0.0178€/Re	53,88,764	0.0179€/Re	53,58,659
		Total Rs.1,33,38,719		Total Rs.1,32,75,578	

$$contribution\ ratio\ (with\ hedging) = \frac{1,33,38,719\ -1,07,30,000}{1,33,38,719} X\ 100 = 19.56\%$$

$$contribution\ ratio\ (with\ hedging) = \frac{1,32,75,578\ -1,07,30,000}{1,32,75,578} X\ 100 = 19.17\%$$

Hedging is recommended

Question

- A company operating in Japan has today effected sales to an Indian company, the payment being due 3 months from the date of invoice. The invoice amount is 108 lakh yens. At today's spot rate, it is equivalent to Rs.30 lakhs. It is anticipated that the exchange rate will decline by 10% over the 3 months period and in order to protect Yen payments, the importer proposes to take appropriate action in foreign exchange market. The 3-months forward rate is presently quoted as 3.3 yen per rupee. You are required to calculate the expected and how it can be hedged by a forward contract.

Answer

- Spot rate — 1Re. = 108/30 i.e. — 3.60Yens
- Expected rate after 3 months — 1Re. = 3.60 yen x 0.90 — 3.24 yens
- Forward rate (3 months) — 1Re. — 3.3 yens
- Statement showing anticipated loss without hedging
  - Payable on the date of import — Rs.30.00L
  - Actual payment after 3 months without forward (108lakhs/3.24) — Rs.33.33L
  - Loss — Rs3.33 lakhs
- Statement showing anticipated loss with hedging:
  - Payable on the date of import — Rs.30.00L
  - Actual payment after 3 months without forward (108lakhs/3.24) — Rs.32.73L
  - Loss — Rs2.73 lakhs
- Forward is expected to reduce the loss.

Question

- X ltd. an Indian company has an export exposure of 10 million (100 lacs) yen, value September and yen is not directly quoted against rupee. The current spot rates are USD/INR = 41.79 and USD/JPY = 129.75
- It is estimated that Yen will depreciate to 144 level and rupee will depreciate against dollar to 43
- Forward rate for September 1998 USD/Yen = 137.75 and USD/INR = 42.89
- You are required
  - To calculate the expected loss if hedging is not done. How the position will change with company taking forward cover.
  - If the spot rate on 30th September 1998 was eventually USD/Yen = 137.85 and USD/INR = 42.78 is the decision to take forward cover justified.

Answer