

**Question – 14**

A Inc. and B Inc. intend to borrow \$ 200,000 and \$200,000 in ¥ respectively for a time horizon of one year. The prevalent interest rates are as follows:

| <b>Company</b> | <b>¥ Loan</b> | <b>\$ Loan</b> |
|----------------|---------------|----------------|
| A Inc          | 5%            | 9%             |
| B Inc          | 8%            | 10%            |

The prevalent exchange rate is \$1 = ¥120.

They entered in a currency swap under which it is agreed that B Inc will pay A Inc @ 1% over the ¥ Loan interest rate which the later will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extent of 9%. Keeping the exchange rate invariant, quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.

**(Exam May – 2011, SM TYK – 06) (8 Marks)**

**Solution:**

**A Incorporation**

**Today**

|                                  |                 |
|----------------------------------|-----------------|
| Borrow yen from bank             | + ¥ 2,40,00,000 |
| Yen transfer to B incorporation  | – ¥ 2,40,00,000 |
| \$ Transfer from B Incorporation | + \$ 2,00,000   |
|                                  | <hr/>           |
|                                  | \$ 2,00,000     |

**After 1 year**

|   |                          |
|---|--------------------------|
| Interest paid to bank (¥ 2,40,00,000 × 5%)                        | – ¥12,00,000             |
| Interest transferred from B incorporation<br>(¥ 2,40,00,000 × 6%) | + 14,40,000              |
| Interest transferred to B Incorporation<br>(\$2,00,000 × 9%)      | – \$ 18,000              |
|   | <hr/>                    |
|   | – \$ 18,000 + ¥ 2,40,000 |

$$\begin{aligned} \text{Net Interest paid in \$} &= \$18,000 - \left( \frac{\text{¥} 2,40,000}{120} \right) \\ &= \$16,000 \end{aligned}$$

$$\text{Effective Cost} = \frac{\$ 1,600}{\$ 2,00,000} \times 100 = 8\%$$

$$\text{Without Swap} = 9\%$$

$$\text{Gain} = \underline{1\%}$$

### **B Incorporation**

#### **Today**

|                        |               |
|------------------------|---------------|
| Borrow \$ from Bank    | + \$ 2,00,000 |
| Transfer \$ to A Inc.  | - \$ 2,00,000 |
| Transfer ¥ from A Inc. | ¥ 2,40,00,000 |
|                        | ¥ 2,40,00000  |

#### **After 1 Year**

|  |                         |
|--|-------------------------|
| Interest paid to bank (\$ 2,00,000 × 10%)        | - \$ 20,000             |
| Interest transfer from A Inc. (\$ 200000 × 9%)   | + \$ 18,000             |
| Interest transfer to A Inc. (¥ 2,40,00,000 × 6%) | - ¥ 14,40,000           |
|  | - ¥ 14,40,000 - \$2,000 |

$$\begin{aligned} \text{Interest paid in ¥} &= \text{¥} 14,40,000 + (\$ 2,000 \times 120) \\ &= \text{¥} 16, 80,000 \end{aligned}$$

$$\begin{aligned} \text{Effective Cost} &= \frac{\text{¥} 16,80,000}{\text{¥} 2,40,00,000} \times 100 \\ &= 7\% \end{aligned}$$

$$\text{Without Swap} = 8\%$$

$$\text{Gain} = \underline{1\%}$$

**PART 5: CAP, COLLAR & FLOOR**

**Question – 15**

MPD Ltd. issues a ₹ 50 Million Floating Rate Loan on July 1, 2018 with resetting of coupon rate every 6 Months equal to LIBOR + 50 bps.

MPD is interested in an Interest rate Collar Strategy of selling a Floor and buying a cap. MPD buys the 3 years cap and sell 3 years Floor as per the following details on July 1, 2018:

|                  |  |
|------------------|--|
| Principal Amount | ₹ 50 Million   |
| Strike Rate      | 5% for Floor & 8% for Cap                                    |
| Reference Rate   | 6 months LIBOR   |
| Premium          | NIL, since premium paid for cap = premium received for Floor |

The Reset dates & Interest rates p.a., on that dates are:

| Reset Date | LIBOR(%) |
|------------|----------|
| 31/12/2018 | 7.00     |
| 30/06/2019 | 8.00     |
| 31/12/2019 | 6.00     |
| 30/06/2020 | 4.75     |
| 31/12/2020 | 4.25     |
| 30/06/2021 | 5.25     |

Using the above data, you are required to determine:

- (i) Effective Interest paid out at each six reset dates, (Round off to the nearest rupee)
- (ii) Average overall effective rate of interest p.a. (round off to 2 decimals)

**(Exam May – 2022) (8 Marks)**

**Solution:**

**(i) Calculation of Effective Cost**

| Reset Date | LIBOR | Date of payment | No. of days | Intt paid (L+0.50%) | Cap Receipt | Floor payment | Net       |
|------------|-------|-----------------|-------------|---------------------|-------------|---------------|-----------|
| 31/12/2018 | 7.00% | 30/06/2019      | 181         | 18,59,589           | 0           | 0             | 18,59,589 |
| 30/06/2019 | 8.00% | 31/12/2019      | 184         | 21,42,466           | 0           | 0             | 21,42,466 |
| 31/12/2019 | 6.00% | 30/06/2020      | 182         | 16,16,120           | 0           | 0             | 16,16,120 |
| 30/06/2020 | 4.75% | 31/12/2020      | 184         | 13,19,672           | 0           | 62,842        | 13,82,514 |
| 31/12/2020 | 4.25% | 30/06/2021      | 181         | 11,77,740           | 0           | 1,85,959      | 13,63,699 |

|            |       |            |       |           |   |   |           |
|------------|-------|------------|-------|-----------|---|---|-----------|
| 30/06/2021 | 5.25% | 31/12/2021 | 184   | 14,49,315 | 0 | 0 | 14,49,315 |
|            |       |            | 1,096 |           |   |   | 98,13,703 |

(ii) Average Annual Rate =  $\frac{98,13,703}{5,00,00,000} \times 100 \times \frac{365}{1,096} = 6.54\% \text{ p.a.}$

**Question – 16**

A textile manufacturer has taken floating interest rate loan of ₹ 40,00,000 on 1<sup>st</sup> April, 2012. The rate of interest at the inception of loan is 8.5% p.a. interest is to be paid every year on 31<sup>st</sup> March, and the duration of loan is four years. In the month of October 2012, the Central bank of the country release following projections about the interest rates likely to prevail in future.

| Dates                        | Interest Rate |
|------------------------------|---------------|
| 31 <sup>st</sup> March, 2013 | 8.75%         |
| 31 <sup>st</sup> March, 2014 | 10.00%        |
| 31 <sup>st</sup> March, 2015 | 10.50%        |
| 31 <sup>st</sup> March, 2016 | 7.75%         |

- (i) Advise how borrower can hedge the risk arising out of expected rise in the rate of interest when he is interested in pegging his interest cost at 8.50% p.a. and if option on Interest Rate is available at 0.75% p.a.
- (ii) Assume that the premium negotiated by both the parties at the above-mentioned rate which is to be paid on upfront basis and the actual rate of interest on the respective due dates happens to as follows:

| Dates                        | Interest Rate |
|------------------------------|---------------|
| 31 <sup>st</sup> March, 2013 | 10.20%        |
| 31 <sup>st</sup> March, 2014 | 11.50%        |
| 31 <sup>st</sup> March, 2015 | 9.25%         |
| 31 <sup>st</sup> March, 2016 | 8.25%         |

EVALUATE how the settlement will be executed on the respective interest due dates.

**(Exam Nov – 2017, SM TYK – 07, RTP May – 2022 & MTP March – 22)  
(8 Marks)**

**Solution:**

As borrower does not want to pay more than 8.5% p.a., on this loan where the rate of interest is likely to rise beyond this, hence, he has hedge the risk by

entering into an agreement to buy interest rate caps with the following parameters:

- Notional Principal: ₹ 40,00,000/-
- Strike rate: 8.5% p.a.
- Reference rate: the rate of interest applicable to this loan
- Calculation and settlement date: 31<sup>st</sup> March every year
- Duration of the caps: till 31<sup>st</sup> March 2016
- Premium for caps: negotiable between both the parties

To purchase the caps this borrower is required to pay the premium upfront at the time of buying caps. The payment of such premium will entitle him with right to receive the compensation from the seller of the caps as soon as the rate of interest on this loan rises above 8.5%. The compensation will be at the rate of the difference between the rate of none of the cases the cost of this loan will rise above 8.5% calculated on ₹ 40,00,000/-. This implies that in none of the cases the cost of this loan will rise above 8.5%. This hedging benefit is received at the respective interest due dates at the cost of premium to be paid only once.

The premium to be paid on 1st October 2012 is 30,000/- (₹ 40,00,000 × 0.75/100). The payment of this premium will entitle the buyer of the caps to receive the compensation from the seller of the caps whereas the buyer will not have obligation. The compensation received by the buyer of caps will be as follows:

### **On 31<sup>st</sup> March 2013**

The buyer of the caps will receive the compensation at the rate of 1.70% (10.20 - 8.50) to be calculated on ₹ 40,00,000, the amount of compensation will be ₹ 68,000/- (40,00,000 × 1.70/100).

### **On 31<sup>st</sup> March 2014**

The buyer of the caps will receive the compensation at the rate of 3.00% (11.50 - 8.50) to be calculated on ₹ 40,00,000/-, the amount of compensation will be ₹ 1,20,000/- (40,00,000 × 3.00/100).

### **On 31<sup>st</sup> March 2015**

The buyer of the caps will receive the compensation at the rate of 0.75% (9.25 – 8.50) to be calculated on ₹ 40,00,000/-, the amount of compensation will be ₹ 30,000 (40,00,000 × 0.75/100).

**On 31<sup>st</sup> March 2016**

The buyer of the caps will not receive the compensation as the actual rate of interest is 8.25% whereas strike rate of caps is 8.5%. Hence, his interest liability shall not exceed 8.50%.

Thus, by paying once the premium upfront buyer of the caps gets the compensation on the respective interest due dates without any obligations.

**Question – 17**

XYZ Limited borrows £ 15 Million of six months LIBOR + 10.00% for a period of 24 months. The company anticipates a rise in LIBOR, hence it proposes to buy a Cap Option from its Bankers at the strike rate of 8.00%. The lump sum premium is 1.00% for the entire reset periods and the fixed rate of interest is 7.00% per annum. The actual position of LIBOR during the forthcoming reset period is as under:

| <b>Reset Period</b> | <b>LIBOR</b> |
|---------------------|--------------|
| 1                   | 9.00%        |
| 2                   | 9.50%        |
| 3                   | 10.00%       |

You are required to show how far interest rate risk is hedged through Cap Option.

For calculation, work out figures at each stage up to three decimal points and amount nearest to £. It should be part of working notes.

**(SM TYK – 03)**

**Solution:**

**(i) Calculation of Amortization of Premium**

Premium Amount = €1,50,00,000 × 1% = €1,50,000

Rate of discount = 7% p.a.

## INTEREST RATE RISK MANAGEMENT

6 months = 3.5%

Cumulative factor = 3.5%, 4 Period  
= 3.671

Amortization Amount =  $\frac{£ 1,50,000}{3.671(PVAF, 3.5\%)}$   
= £ 40,861

Statement showing effective interest Rate 8% ↑

| Period | Rate (LIBOR) | Interest paid to Bank (L + 10%) | Cap Receipt | Premium | Effective Interest |
|--------|--------------|---------------------------------|-------------|---------|--------------------|
| I      | 9.00         | £14,25,000                      | (£75,000)   | £40,861 | £13,90,861         |
| II     | 9.50         | £14,62,500                      | (£1,12,500) | £40,861 | £13,90,861         |
| III    | 10.00        | £1,50,000                       | (£1,50,000) | £40,861 | £13,90,861         |
|        |              | £43,87,500                      |             |         | £41,72,583         |

Interest saved due to cap (43,87,500 – 41,72,583) = £ 2,14,917

### (6) T. BOND FUTURE

#### Question – 18

In March 2020, XYZ bank sold some 7% interest rate futures underlying notional 7.50% coupon bonds. The exchange provides following details of eligible securities that can be delivered:

| Security      | Quoted Price of Bond | Conversion Factor |
|---------------|----------------------|-------------------|
| 7.96 GOI 2023 | 1037.40              | 1.0370            |
| 6.55 GOI 2025 | 926.40               | 0.9060            |
| 6.80 GOI 2029 | 877.50               | 0.9195            |
| 6.85 GOI 2026 | 972.30               | 0.9643            |
| 8.44 GOI 2027 | 1146.30              | 1.1734            |
| 8.85 GOI 2028 | 1201.70              | 1.2428            |

Recommend the Security that should be delivered by the XYZ bank if future settlement price is 1,000.

(MTP April – 2021)

#### Solution:

## INTEREST RATE RISK MANAGEMENT

| Bond  | Future Value | Conversion Factor | Future Value × Conversion Factor | Price   | Gain/Loss |
|-------|--------------|-------------------|----------------------------------|---------|-----------|
| 7.96% | 1,000        | 1.037             | 1037                             | 1037.40 | (0.40)    |
| 6.55% | 1,000        | 0.9060            | 906                              | 926.40  | (20.40)   |
| 6.80% | 1,000        | 0.9195            | 919.50                           | 877.50  | 42.00     |
| 6.85% | 1,000        | 0.9643            | 964.30                           | 972.30  | (8)       |
| 8.44% | 1,000        | 1.1734            | 1173.40                          | 1146.30 | 27.10     |
| 8.85% | 1,000        | 1.2428            | 1242.80                          | 1201.70 | 4.11      |

Bond 6.80% GOI 2029 Bond should be delivered due to maximum profit.

### **ADDITIONAL QUESTIONS**

#### **Question – 01**

XY Ltd. is planning to expand its operations in view of growing demand for its products. For this purpose, it is considering to borrow an amount of ₹ 100 crores for a period of 3 months in the coming 6 months' time from now. The current rate of interest is 8% per annum but due to inflation it may go up in 6 months' time. The company wants to hedge itself against the likely increase in interest rate.

The company's Bankers quoted an FRA (Forward Rate Agreement) at 8.20% per annum.

You are required to calculate due to FRA:

- (i) The actual interest rate if the Banker pays to XY Ltd. an amount of ₹ 9,78,952.52
- (ii) The actual interest rate if XY Ltd. will pay to the Banker a sum of ₹ 9,80,872.98

**(Exam November – 2024) (6 Marks)**

#### **Solution:**

Final settlement amount shall be computed by using formula:

$$= \frac{(N)(RR - FR)(dtm/DY)}{[1 + RR(dt m/DY)]}$$

Where,

N = the notional principal amount of the agreement;

RR = Actual Reference Rate for the maturity specified by the contract prevailing on the contract settlement date;

FR = Agreed-upon Forward Rate; and

dtm = maturity period in days or months of the forward rate agreement

DY = Total number of days or month in a year as per convention

Accordingly,

- i. If Banker pays to XY Ltd. an amount of ₹ 9,78,952.52 then actual interest shall be computed as follows:

$$₹ 9,78,952.52 = \frac{(\text{₹ } 10 \text{ crore})(RR - 0.082)(3/12)}{[1 + RR(3/12)]}$$

$$RR = 0.086$$

Thus, the actual interest rate happens to be 8.60% on the settlement date.

- ii. If XY Ltd. pays to Banker an amount of ₹ 9,80,872.98 then actual interest shall be computed as follows:

$$₹ 9,80,872.98 = \frac{(\text{₹ } 100 \text{ crore})(RR - 0.082)(3/12)}{[1 + RR(3/12)]}$$

$$RR = 0.078$$

Thus, the actual interest rate happens to be 7.80% on the settlement date.

**Question – 02**

DEF Ltd. has implemented a strategy to manage its exposure to fluctuating interest rates by engaging in both interest rate caps and floors.

The company has purchased \$ 50,00,000 (i.e. call options on interest rates) cap of 8% at a premium of 0.75% of the face value to protect against rising interest rates. \$ 50,00,000 (i.e. put options on interest rates) floor of 5% is also available at a premium of 0.85% of face value.

You are required to analyze the following situation:

- (i) If interest rate rise to 10 percent, what is the amount received by DEF Ltd. ? What are the net saving from the cap ?
- (ii) If DEF Ltd. also purchase a floor, what are net savings if interest rate rise to 10% ?
- (iii) Calculate net savings if interest rates fall to 4 percent considering cap & floor both purchase.
- (iv) If DEF Limited has purchase the cap and sell the floor and there is price rise is 11%, what will be net saving to the company?

**(Exam May – 2025) (7 Marks)**

**Solution:**

- (i) Premium for purchasing the Cap

$$= 0.0075 \times \$ 50,00,000 = \$ 37,500$$

If interest rate rises to 10%, Cap purchase receive (10% - 8% = 2%) i.e.,

$$= \$ 50,00,000 \times 2/100 = \$ 1,00,000,$$

$$= (\$ 1,00,000 - \$ 37,500) = \$ 62,500$$

$$\text{Net saving} = \$ 62,500$$

- (ii) Purchase Floor, premium for Floor

$$= 0.0085 \times \$ 50,00,000 = \$ 42,500 \text{ and}$$

Total premium will be \$ 37,500 + \$ 42,500 = \$ 80,000 and

$$= (\$ 50,00,000 \times 0.02) - \$ 80,000 = \$ 20,000$$

$$\text{Net saving} = \$ 20,000$$

- (iii) If interest rate falls to 4 percent, there will be no payoff from the Cap, but there will be payoff from Floor.

However, the total premium (\$ 37,500 + \$ 42,500) = \$ 80,000 is the cost.

$$\text{Payoff from floor} = \$ 50,00,000 \times 0.01 (5\% - 4\% = 1\%) = \$ 50,000$$

## INTEREST RATE RISK MANAGEMENT

$$= \$ 50,000 - \$ 80,000 = (\$ 30,000)$$

Net loss =  $(\$ 30,000)$

(iv) Sell the Floor, company will receive

$$= 0.0085 \times \$ 50,00,000 = \$ 42,500 \text{ and}$$

Pay premium for Cap

$$= 0.0075 \times \$ 50,00,000 = \$ 37,500,$$

Net premium receiving will be

$$= \$ 42,500 - \$ 37,500 = \$ 5,000$$

If interest rate rises to 11%, Cap purchase receive

$$= 0.03 \times \$ 50,00,000 = \$ 1,50,000$$

$$= \$ 1,50,000 + \$ 5,000 = \$ 1,55,000$$

Net saving =  $\$ 1,55,000$

## CHAPTER – 05

# FOREIGN EXCHANGE EXPOSURE & RISK MANAGEMENT

### (1) BASICS

#### **Question – 01**

Given:

$$\text{US\$ } 1 = \text{¥ } 107.31$$

$$\text{£ } 1 = \text{US\$ } 1.26$$

$$\text{A\$ } 1 = \text{US\$ } 0.70$$

- (i) Calculate the cross rate for Pound in Yen terms
- (ii) Calculate the cross rate for Australian Dollar in Yen terms
- (iii) Calculate the cross rate for Pounds in Australian Dollar terms

(RTP November – 2020)

#### **Solution:**

#### **(i) Calculation the cross rate for Pounds in ¥ terms**

$$\text{¥}/\$ = 107.31$$

$$\$/\text{£} = 1.26$$

$$\text{¥}/\text{£} = ?$$

$$\text{¥}/\text{£} = 107.31 \times 1.26$$

$$= \text{¥ } 135.21$$

#### **(ii) Calculation of cross rate for A\$ in ¥ terms**

$$\text{¥}/\$ = 107.31$$

$$\$/\text{A\$} = 0.70$$

$$\begin{aligned}\text{¥/A\$} &= 107.31 \times 0.70 \\ &= \text{¥ } 75.12\end{aligned}$$

**(iii) Calculation of cross rate for £ in A\$**

$$\text{\$/£} = 1.26$$

$$\text{\$/A\$} = 0.7$$

$$\begin{aligned}\text{A\$/£} &= \frac{1}{0.7} \times 1.26 \\ &= \text{A\$ } 1.80.\end{aligned}$$

**Question – 02**

On January 28, 2013 an importer customer requested a Bank to remit Singapore Dollar (SGD) 2,500,000 under an irrevocable Letter of Credit (LC). However, due to unavoidable factors, the Bank could effect the remittances only on February 4, 2013. The inter-bank market rates were as follows:

|         |   | January 28, 2013   | February 4, 2013   |
|---------|---|--------------------|--------------------|
| US\$ 1  | = | ₹ 45.85/45.90      | ₹ 45.91/45.97      |
| GBP £ 1 | = | US\$ 1.7840/1.7850 | US\$ 1.7765/1.7775 |
| GBP £ 1 | = | SGD 3.1575/3.1590  | SGD 3.1380/3.1390  |

The Bank wishes to retain an exchange margin of 0.125%

Required:

How much does the customer stand to gain or lose due to the delay?

(Note: Calculate the rate in multiples of 0.0001)

**(SM TYK – 09 & Exam November – 2011) (4 Marks)**

**Solution:**

**Calculation of Exchange Rate ₹/SGD**

**28/01/2013**

$$\text{₹/\$} = 45.90$$

$$\text{\$/£} = 1.7850$$

$$\begin{aligned}\text{SGD}/\text{£} &= 3.1575 \\ \text{₹}/\text{SGD} &= \text{₹}/\$ \times \$/\text{£} \times \text{SGD}/\text{£} \\ &= 45.90 \times 1.7850 \times \frac{1}{3.1575} \\ &= 25.9482 + 0.125\% \\ &= \text{₹ } 25.9806.\end{aligned}$$

**04/02/2013**

$$\begin{aligned}\text{₹}/\$ &= 45.97 \\ \$/\text{£} &= 1.7775 \\ \text{SGD}/\text{£} &= 3.1380 \\ \text{₹}/\text{SGD} &= 45.97 \times 1.7775 \times \frac{1}{3.1380} \\ &= 26.0341 + 0.125\% \\ &= \text{₹ } 26.0719\end{aligned}$$

Loss due to delay

$$\begin{aligned}&= (25.9806 - 26.0719) \times \text{SGD } 25,00,000 \\ &= \text{₹ } 2,28,250.\end{aligned}$$

**Question – 03**

The price of a bond just before a year of maturity is \$ 5,000. Its redemption value is \$ 5,250 at the end of the said period. Interest is \$ 350 p.a. The Dollar appreciates by 2% during the said period. Calculate the rate of return.

**(SM TYK – 01 & Exam May – 2012) (4 Marks)**

**Solution:**

Rate of return

US investor

$$\text{Return} = \frac{\$ 5,250 + \$ 350 - \$ 5,000}{\$ 5,000} \times 100 = 12\%$$

Other than US investor

$$\text{Return} = [(1.12 \times 1.02) - 1] \times 100 = 14.24\%$$

**Question – 04**

Mr. Mammen, an Indian investor invests in a listed bond in USA. If the price of the bond at the beginning of the year is USD 100 and it is USD 103 at the end of the year. The coupon rate is 3% payable annually.

Find the return on investment in terms of home country currency if:

- (i) USD is Flat.
- (ii) USD appreciates during the year by 3%.
- (iii) USD depreciates during the year by 3%.
- (iv) Indian Rupee appreciates during the year by 5%.

**(RTP May – 2022 & Exam July – 2021) (4 Marks)**

**Solution:**

**Calculation of the return on investment**

**(i) If USD is flat**

$$\text{Return on Investment} = \frac{\$ 106 - \$ 100}{\$ 100} \times 100 = 6\% \text{ p.a.}$$

**(ii) If \$ appreciator by 3%**

$$\text{Return on Investment} = [(1.06 \times 1.03) - 1] \times 100 = 9.18\%$$

**(iii) If \$ deprecator by 3%**

$$\text{Return on Investment} [(1.06 \times 0.97) - 1] \times 100 = 2.82\%$$

**(iv) If ₹ appreciator by 5% (If \$ depreciates by 5%)**

$$\text{Return on Investment} = [(1.06 \times 0.95) - 1] \times 100 = 0.7\%$$

**(2) SPOT MARKET**

**Question – 05**

Followings are the spot exchange rates quoted at three different forex markets:

## FOREIGN EXCHANGE EXPOSURE & RISK MANAGEMENT

|         |                    |
|---------|--------------------|
| 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.

(SM TYK – 13)

### Solution:

#### **Arbitrage process**

Sell \$ in Mumbai

$$= \$1,00,00,000 \times 48.30 = ₹ 48,30,00,000$$

Buy £ in London

$$= \frac{₹ 48,30,00,000}{77.52} = £ 62,30,650.15$$

Sell £ in New York

$$= £ 62,30,650.15 \times 1.6231 = \$ 1,01,12,968.27$$

Arbitrage

$$= \$ 1,01,12,968.27 - \$1,00,00,000 = \$ 1,12,968.27$$

#### **Question – 06**

USD 10,000 is lying idle in your Bank Account. You are able to get the following quotes from the dealers:

| Dealer | Quote          |
|--------|----------------|
| A      | EUR/USD 1.1539 |
| B      | EUR/GBP 0.9094 |
| C      | GBP/USD 1.2752 |

Is there an opportunity of gain from these quotes?

**(Exam November – 2020) (4 Marks)**

**Solution:**

The arbitrageur can proceed as started below to realize arbitrage gains.

(i) Buy € from US\$ 10,000 from Dealer A

$$(10,000/1.1539) = € 8,666.26$$

(ii) Convert these € to £ by selling to Dealer B

$$(€ 8,666.26 \times 0.9094) = £ 7,881.09$$

(iii) Convert £ to US\$ by selling to Dealer C

$$(£ 7,881.09 \times 1.2752) = US\$ 10,049.97$$

There is net gain of US\$ 10,049.97 less US\$ 10,000 i.e. US\$ 49.97 or US\$ 50.00.

**Question – 07**

Citi Bank quotes JPY/ USD 105.00 - 106.50 and Honk Kong Bank quotes USD/JPY 0.0090- 0.0093.

- (a) Are these quotes identical if not then how they are different?
- (b) Is there a possibility of arbitrage?
- (c) If there is an arbitrage opportunity, then show how would you make profit from the given quotation in both cases if you are having JPY 1,00,000 or US\$ 1,000.

**(RTP November – 2020)**

**Solution:**

City bank

Honk Kong Bank

¥/\$ 105.00/106.50

\$/¥ 0.0090/0.0093

\$/¥ 0.0094/0.0095

¥/\$107.53/111.11

- (i) No. these quote are not identical, City bank's quote direct quote for yen & Honk Kong bank's quote direct quote for \$.

- (ii) Since City bank rates of \$/¥ 0.0094/0.0095, both rate are higher than Honk Kong bank's rate, hence there is a possibility of arbitrage.

**Arbitrage Gain**

If we have ¥ 1,00,000

Buy \$ from City Bank

$$= \frac{¥ 1,00,000}{106.50} = \$ 938.967$$

Sell \$ to Honk Kong Bank

$$= \$ 938.967 \times 107.53 = ¥ 1,00,967$$

$$\text{Gain} = ¥ 1,00,967 - ¥ 1,00,000$$

$$= ¥ 967$$

It we have \$ 1,000

Buy ¥ from Honk Kong Bank

$$= \$ 1,000 \times 107.53 = ¥ 1,07,530$$

Sell ¥ to City bank

$$\frac{¥ 1,07,530}{106.50} = \$ 1,009.67$$

$$\text{Gain} = \$ 1,009.67 - \$ 1,000$$

$$= \$ 9.67$$

**(3) FORWARD CONTRACT**

**Question – 08**

The following 2-way quotes appear in the foreign exchange market:

|          | Spot            | 2-months forward |
|----------|-----------------|------------------|
| RS/US \$ | ₹ 46.00/₹ 46.25 | ₹ 47.00/₹ 47.50  |

Required:

- (i) How many US dollars should a firm sell to get ₹ 25 lakhs after 2 months?

## FOREIGN EXCHANGE EXPOSURE & RISK MANAGEMENT

- (ii) How many Rupees is the firm required to pay to obtain US \$ 2,00,000 in the spot market?
- (iii) Assume the firm has US \$ 69,000 in current account earning no interest. ROI on Rupee investment is 10% p.a. Should the firm encase the US \$ now or 2 months later?

**(SM TYK – 11)**

### Solution:

- (i) \$ Sell by firm to get ₹ 25,00,000

$$\frac{\text{₹ } 25,00,000}{47} = \$ 53,191.49$$

- (ii) Rupees required to buy \$ 2,00,000

$$\$ 2,00,000 \times ₹ 46.25 = ₹ 92,50,000$$

- (iii) Encase Now

$$\text{Sell } \$ 69,000 \times 46 = ₹ 31,74,000$$

Invest ₹ 31,74,000 @ 10% p.a for 2 Months

$$\begin{aligned} \text{Cash Inflow} &= 31,74,000 + (31,74,000 \times 10\% \times \frac{2}{12}) \\ &= ₹ 32,26,900 \end{aligned}$$

Encase after 2 months

Sell \$ 69,000 at 2 months FR

$$\$ 69,000 \times 47 = ₹ 32,43,000$$

Encase after 2 months is better due to higher cash inflows.

### Question – 09

In March, 2009, the Multinational Industries make the following assessment of dollar rates per British pound to prevail as on 01/09/2009:

| <b>\$/Pound</b> | <b>Probability</b> |
|-----------------|--------------------|
| 1.60            | 0.15               |
| 1.70            | 0.20               |