After 6 Months

Cash Inflows

Investment Amount (₹)

(₹ 40,00,000 × 1.06) = ₹ 42,40,000

Buy $ at FR $\left(\frac{₹\ 42,40,000}{48.8190}\right)$ = $ 86,851.43

Cash Outflows

Repayment of loan

$ 83,312 (1.04) = $ 86,644.48

Arbitrage Gain = ($ 86,851.43 – $ 86,644.48)

= $ 206.95

Or $ 206.95 × 48.8190 = ₹ 10,103

Question – 27

Given the following information:

Exchange rate – Canadian dollar 0.665 per DM (spot)

Canadian dollar 0.670 per DM (3 months)

Interest rates – DM 7% p.a.

Canadian Dollar – 9% p.a.

What operations would be carried out to take the possible arbitrage gains?

(SM TYK – 27, Exam May – 2011) (4 Marks)

Solution:

Calculation of Premium in DM & Interest Rate Difference

Premium is DM $= \left(\frac{\$\ 0.670 - \$\ 0.665}{\$\ 0.665}\right) \times 100 \times \frac{12}{3}$

= 3.007% p.a.

Interest Rate Difference = 9% – 7% = 2%

Since premium in DM is more than interest rate difference, hence borrow in Can $ & Invest is DM.

Arbitrage Process

It is assumed that we borrow can $1,000.

Today

Borrow Can $ 1,000 @ 9% p.a. for 3 months.

Sell Can $ at SR $\frac{\text{Can \$ 1000}}{0.665}$ = DM 1,503.7594

Invest DM 1,503.7594 @ 7% p.a. for 3 Months.

After 3 Months

Cash Inflows

Investment Amount

DM = ₹ 1,503.7594 (1.0175)

= 1,530.0752

Sell DM at FR = 1,530.0752 × 0.670

= Can $ 1,025.15

Cash Outflows

Repayment = Can $ 1,000 (1.0225)

= Can $ 1,022.50

Arbitrage gain = (Can $ 1,025.15 – Can $ 1022.50)

= $ 2.65.

Question – 28

Spot rate 1 US$ = ₹ 68.50

USD premium on a six month forward in 3%. The annualized interest in US is 4% and 9% in India.

Is there any arbitrage possibility? If yes, how a trader can take advantage of the situation if he is willing to borrow USD 3 million.

(Exam November – 2018) (8 Marks)

Solution:

(i) Calculation of Forward Rate

$$\text{Premium in \$} = \frac{F-S}{S} \times 100 \times \frac{12}{6}$$

$$6 = \frac{F-68.50}{68.50} \times 100 \times \frac{12}{6}$$

$$6 \times \frac{6}{12} = \frac{F-68.50}{68.50} \times 100$$

$$0.03 = \frac{F-68.50}{68.50}$$

$$2.055 = F - 68.50$$

$$F = ₹\ 70.56$$

(ii) Premium in $ = 6% P.a.

Interest Rate Different = 9 – 4 = 5%

Yes, there is an arbitrage possibility because premium in $ is not equal to interest rate difference.

Since premium in $ in more than interest rate difference hence borrow from India & invest in USA.

Arbitrage Process.

Today

- Borrow equivalent ₹ ($ 30,00,000)
- Buy $ at SR $\left(\frac{₹\ 20,55,00,000}{68.50}\right)$ = $ 30,00,000
- Invest $ in USA & 4% p.a. for 6 months.

- Contract to sell $ at 6 months FR

After 6 Months

Cash Inflows

Investment Amount in ($) [$ 30,00,000 (1.02)] = $ 30,60,000

Sell $ at 6 Months FR [$ 30,60,000 × 70.56] = ₹ 21,59,13,600

Cash outflows

Repayment [₹ 20,55,00,000 (1.045)] = ₹ 21,47,47,500

Arbitrage Gain = ₹ 11,66,100

or $\frac{11,66,100}{70.56}$ = $ 16,526

(III) PURCHASING POWER PARITY

Question – 29

The rate of inflation in India is 8% per annum and in the U.S.A. it is 4%. The current spot rate for USD in India is ₹ 46. What will be the expected rate after 1 year and after 4 years applying the Purchasing Power Parity Theory.

(SM TYK – 30, Exam May – 2010) (4 Marks)

Solution:

Calculation of expected rate applying PPP

1 year

$$\frac{ES_1}{₹\ 46} = \frac{1.08}{1.04}$$

$$ES_1 = \frac{46 \times 1.08}{1.04} = ₹\ 47.77$$

2 year

$$\frac{ES_2}{47.77} = \frac{1.08}{1.04}$$

$$ES_2 = \frac{₹\ 47.77 \times 1.08}{1.04} = ₹\ 49.61$$

3 year

$$\frac{ES_3}{49.61} = \frac{1.08}{1.04}$$

$$ES_3 = \frac{₹\ 49.61 \times 1.08}{1.04} = ₹\ 51.52$$

4 year

$$\frac{ES_4}{51.52} = \frac{1.08}{1.04}$$

$$ES_4 = \frac{₹\ 51.52 \times 1.08}{1.04} = ₹\ 53.50$$

(IV) INTERNATIONAL FISHER EFFECT

Question – 30

A US investor chose to invest in Sensex for a period of one year. The relevant information is given below.

Size of investment ($)	20,00,000
Spot rate 1 year ago (₹/$)	42.50/60
Spot rate now (₹/$)	43.85/90
Sensex 1 year ago	3,256
Sensex now	3,765
Inflation in US	5%
Inflation in India	9%

(i) Compute the nominal rate of return to the US investor.

(ii) Compute the real depreciation /appreciation of Rupee.

(iii) What should be the exchange rate if relevant purchasing power parity holds good?

(iv) What will be the real return to an Indian investor in Sensex?

(RTP May – 2022 & January – 2021)

Solution:

(i) Calculation of nominal Rate of Return to US Investor

Size of investment = $ 20,00,000

Sell $ 1 year ego = $ 20,00,000 × ₹ 42.50

= ₹ 8,50,00,000

Invest ₹ 8,50,00,000 in sensex

After 1 year Investment value $= \frac{₹\ 8,50,00,000}{3,256} \times 3,765$

= ₹ 9,82,87,776

Buy $ at SR $= \frac{₹\ 9,82,87,776}{43.90}$

= $ 22,38,901

Nominal rate of return to US investor

$= \frac{\$\ 22,38,901 - \$\ 20,00,000}{\$\ 20,00,000} \times 100$

= ₹ 11.94% P.a.

(ii) Calculation of real appreciation or deprecation in ₹

Real rate of $ (Without Inflation)

Bid Rate $= \frac{₹\ 43.85}{s} = \frac{1.09}{1.05}$

S $= \frac{43.85 \times 1.05}{1.09} = 42.24$

$= \frac{S - F}{F} \times 100$

$= \frac{42.50 - 42.24}{42.24} \times 100 = 0.61\%$

Ask Rate $= \frac{₹\ 43.90}{S} = \frac{1.09}{1.05}$

S $= \frac{₹\ 43.90 \times 1.05}{1.09} = 42.29$

$$= \frac{42.60 - 42.29}{42.29} \times 100 = 0.73\% \text{ Premium in } ₹$$

(iii) Calculation of Estimate SR as per PPP

$$\text{Bid Rate} = \frac{E(S)}{42.50} = \frac{1.09}{1.05} - ₹\ 44.12$$

$$\text{Ask Rate} = \frac{E(S)}{42.60} = \frac{1.09}{1.05} - ₹\ 44.22$$

(iv) Real rate of return on sensex for Indian Investor

$$\text{Sensex Return} = \frac{3{,}765 - 3{,}256}{3{,}256} \times 100$$

$$= 15.63\%$$

$$\text{Real Return} = \left[\frac{1.1563}{1.09} - 1\right] \times 100$$

$$= 6.08\%$$

Question – 31

Shoe Company sells to a wholesaler in Germany. The purchase price of a shipment is 50,000 deutsche marks with term of 90 days. Upon payment, Shoe Company will convert the DM to dollars. The present spot rate for DM per dollar 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 deutsche mark at a forward premium or at a forward discount?

(iii) What is the implied differential in interest rates between the two countries? (Use interest-rate parity assumption).

Solution:

(i) It Shoe company want to hedge the risk then it should enter into forward contract & Sell its DK receivable at forward rate i.e. DM/$ 1.70

$$\text{Amount Receivable in \$} = \frac{\text{DM } 50{,}000}{1.70}$$

= $ 29,411.76

(ii) DM is at premium because DM is appreciating in forward market

$$\text{Premium in DM} = \frac{S-F}{F} \times 100$$

$$= \frac{1.71-1.70}{1.70} \times 100 \times \frac{365}{90}$$

= 2.386% P.a.

(iii) Since IRP hold good, hence premium in DM in equal to interest rate difference. Therefore Interest Rate Difference in 2.386% p.a. & rate of interest in DM is less than rate of interest in $ by 2.386% p.a.

Question – 32

XYZ has taken a six-month loan from its foreign collaborator for USD 2 millions. Interest is payable on maturity @ LIBOR plus 1%. The following information is available:

Spot Rate	INR/USD	68.5275
6 months Forward rate	INR/USD	68.4575
6 months LIBOR for USD	2%	
6 months LIBOR for INR	6%	

You are required to :

(i) Calculate Rupee requirements if forward cover is taken.

(ii) Advise the company on the forward cover.

What will be your opinion if spot rate of INR/USD is 68.4275 ?

(Exam Jan – 2021) (8 Marks)

Solution:

(i) Rupee requirement if forward cover is taken:

6 Month Forward rate 68.4575

Interest amount (20,00,000 × 3% × $\frac{6}{12}$)	US$ 30,000
Principal amount	US$ 20,00,000
	US$ 20,30,000

Rupee Requirement = INR 68.4575 × US$ 20,30,000 = INR 13,89,68,725

(ii) Forward Rate as per Interest Rate Parity after 6 months is expected to be:

$= 68.5275 \times \frac{(1.03)}{(1.01)} = 69.8845/US\$$

The company should take forward cover because as per Interest Rate Parity, the rate after 6 months is expected to be higher than forward rate.

However, if spot rate is 68.4275, the expected rate as per Interest Rate Parity shall be:

$= 68.4275 \times \frac{(1.03)}{(1.01)} = 69.7825/US\$$

Thus, still the company should take forward cover.

(6) FOREIGN CURRENCY EXPOSURES

(1) LEADING & LAGGINGS

Question – 33

An Indian importer has to settle an import bill for $ 1,30,000. The exporter has given the Indian exporter two options:

(i) Pay immediately without any interest charges.

(ii) Pay after three months with interest at 5 percent per annum.

The importer's bank charges 15 percent per annum on overdrafts. The exchange rates in the market are as follows:

Spot rate (₹ /$) : 48.35 /48.36

3-Months forward rate (₹/$) : 48.81 /48.83

The importer seeks your advice. Give your advice.

(SM TYK – 21 & Exam November – 2011) (4 Marks)

Solution:

Calculation of Cash Outflows (₹)

(i) Pay Immediately

Rupees required to buy $ 1,30,000 at SR

($ 1,30,000 × 48.36) = ₹ 62,86,800

Borrow ₹ 62,86,800 @ 15% p.a. for 3 Month

Cash Outflows = 62,86,800 (1.0375)

= ₹ 65,22,555

(ii) Pay after 3 months

$ Payable with interest = $ 1,30,000 (1.0375)

= $ 1,31,625

Buy $ 1,31,625 at 3 months FR

Cash outflow = $1,31,625 × 48.83 = ₹ 64,27,249

Pay after 3 months is better due to the lower cash outflows.

Question – 34

Z Ltd. importing goods worth USD 2 million, 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 an interest of 8% per annum.

The bankers of Z Ltd offer a 30 days loan at 10% per annum and their quote for foreign exchange is as follows:

	₹
Spot 1 USD	56.50
60 days forward for 1 USD	57.10
90 days forward for 1 USD	57.50

You are required to evaluate the following options:

(i) Pay the supplier in 60 days, or

(ii) Avail the supplier's offer of 90 days credit.

(SM TYK – 12)

Solution:

Calculation of Cash Outflows (₹)

(i) Pay the supplier in 60 days

Rupees required to buy $ 20,00,000 at 60 days FR

($ 20,00,000 × 57.10) = ₹ 11,42,00,000

Borrow ₹ 11,42,00,000 @ 10% P.a. for 30 day cash outflows

(₹11,42,00,000 × 1.00833) = 11,51,51,667

(ii) Pay the supplier in 90 days

$ Payable with interest = $ 20,00,000 × 1.00667

= $ 20,13,333

Buy $ 20,13,333 at 90 days FR

Cash outflow = $ 20,13,333 × 57.50

= ₹ 11,57,66,667

Pay the supplier in 60 days is better due to the lower cash outflows.

Question – 35

XYZ Ltd. has imported goods to the extent of US$ 8 Million. The payment terms are as under:

(a) 1% discount if full amount is paid immediately; or

(b) 60 days interest free credit. However, in case of a further delay up to 30 days, interest at the rate of 8% p.a. will be charged for additional days after 60 days. M/s XYZ Ltd. has ₹ 25 Lakh available and for remaining it has an offer from bank for a loan up to 90 days @ 9.0% p.a.

The quotes for foreign exchange are as follows:

Spot Rate INR/ US$ (buying) ₹ 66.98

60 days Forward Rate INR/ US$ (buying) ₹ 67.16

90 days Forward Rate INR/ US$ (buying) ₹ 68.03

Advise which one of the following options would be better for XYZ Ltd.

(i) Pay immediately after utilizing cash available and for balance amount take 90 days loan from bank.

(ii) Pay the supplier on 60th day and avail bank's loan (after utilizing cash) for 30 days.

(iii) Avail supplier offer of 90 days credit and utilize cash available.

Further presume that the cash available with XYZ Ltd. will fetch a return of 4% p.a. in India till it is utilized.

Assume year has 360 days. Ignore Taxation.

Compute your working upto four decimals and cash flows in Crore.

(RTP November – 2021)

Solution:

Option 1: Pay Immediately

Particulars	Amount
$ Payable After Discount ($ 8 Million × 0.99)	7.92 Million
Rupees required to buy (7.92 Million × 66.98) ₹ 530.486 Million	₹ 53.0482 Cr.
(-) Cash Available	₹ 0.25 Cr.
Fund Required	₹ 52.7982 Cr.
Borrow ₹ 52.7982 Cr. @ 9% p.a. for 90 days	
Cash Outflow ₹ 52.7982 × $\left[1+\left(0.09 \times \frac{90}{360}\right)\right]$	53.9862 Cr.

Option 2: Pay in 60 days

Particulars	Amount
$ Payable	$ 8 Million
₹ Required to buy $ 8 Million at 60 days FR	
$ 8 Millions × 67.16	₹ 53.7280 Cr.
(-) Available Amount 0.25 × $\left[1 + 0.04 \times \frac{60}{360}\right]$	₹ 0.2517 Cr.
Fund required	₹ 53.4763
Borrow ₹ 53.4763 Cr. @ 9% p.a. for 30 days	
Cash Outflow ₹ 53.4763 Cr. × $\left[1 + \left(0.09 \times \frac{30}{360}\right)\right]$	₹ 53.8774 Cr.

Option 3: Pay in 90 Days

Particulars	Amount
$ Payable with interest $ 8 × $\left[1 + \left(0.08 \times \frac{30}{360}\right)\right]$	8.0533 Million
Rupees required to buy $ 8.0533 at 90 days FR $ 8.0533 × 68.03	₹ 54.7866 Cr.
(-) Available Cash 0.25 Cr × $\left[1 + 0.04 \times \frac{90}{360}\right]$	0.2525 Cr
Cash Outflow	54.5341

Pay the supplier on 60th days is the best option due to lower cash outflows.

(2) INVOICING

Question – 36

XP Pharma Ltd., has acquired an export order for ₹ 10 million for formulations to a European company. The Company has also planned to import bulk drugs worth ₹ 5 million from a company in UK. The proceeds of exports will be realized in 3 months from now and the payments for imports will be due after 6 months from now. The invoicing of these exports and imports can be done in

any currency i.e. Dollar, Euro or Pounds sterling at company's choice. The following market quotes are available.

	Spot Rate	Annualized Premium
₹/$	67.10/67.20	$ - 7%
₹ /Euro	63.15/63.20	Euro - 6%
₹ /Pound	88.65/88.75	Pound - 5%

Advice XP Pharma Ltd. about invoicing in which currency.

(Calculation should be upto three decimal places).

(Exam July – 2021) (8 Marks)

Solution:

(i) Proceeds of Exports in INR = ₹ 10 Million

Position of Inflow under three currencies will be as follows:

Currency	Invoice at Spot Rate	Expected Rate after 3-months	Conversion in INR after 3-months
$	₹ 100,00,000/ ₹ 67.10 = $ 149031.297	₹ 67.10 (1 + 0.07/4) = ₹ 68.27	₹ 68.27 × $ 149031.297 = ₹ 1,01,74,367
€	₹ 100,00,000/ ₹ 63.15 = € 1,58,353.127	₹ 63.15 (1 + 0.06/4) = ₹ 64.10	₹ 64.10 × € 1,58,353.127 = ₹ 1,01,50,435
£	₹ 100,00,000/ ₹ 88.65 = £ 1,12,803.158	₹ 88.65 (1 + 0.05/4) = ₹ 89.76	₹ 89.76 × £ 1,12,803.158 = ₹ 1,01,25,211

(ii) Payment of Import in INR = ₹ 5 Million

Position of outflow under three currencies will be as follows:

Currency	Invoice at Spot Rate	Expected Rate after 6-months	Conversion in INR after 6-months
$	₹ 50,00,000/ ₹ 67.20 = $ 74404.762	₹ 67.20 (1 + 0.07/2) = ₹ 69.55	₹ 69.55 × $ 74404.762 = ₹ 51,74,851

€	₹ 50,00,000/ ₹ 63.20 = € 79,113.924	₹ 63.20 (1 + 0.06/2) = ₹ 65.10	₹ 65.10 × € 79,113.924 = ₹ 51,50,316
£	₹ 50,00,000/ ₹ 88.75 = £ 56,338.028	₹ 88.75 (1 + 0.05/2) = ₹ 90.97	₹ 90.97 × £ 56,338.028 = ₹ 51,25,070

Advice: Since cash inflow is highest (1,01,74,367) in case of $ hence invoicing for Export should be in $. However, cash outflow is least (51,25,070) in case of £ the invoicing for import should be in £.

(3) MONEY MARKET COVER

Question – 37

An exporter is a UK based company. Invoice amount is $3,50,000. Credit period is three months. Exchange rates in London are :

Spot Rate ($/£) 1.5865 – 1.5905

3-month Forward Rate ($/£) 1.6100 – 1.6140

Rates of interest in Money Market:

	Deposit	Loan
$	7%	9%
£	5%	8%

Compute and show how a money market hedge can be put in place. Compare and contrast the outcome with a forward contract.

(SM TYK – 29)

Solution:

Option 1: Forward Cover

Sell $ 3,50,000 at 3 months FR

$$\text{Cash Inflows} = \frac{\$\ 3,50,000}{1.6140} = £\ 2,16,852.54$$

Option 2: Money Market Cover

- Amount to be borrowed from US money market @ 9% p.a. for 3 months

$$\frac{\$\ 3{,}50{,}000}{1 + (0.09 \times 3/12)} = \$\ 3{,}42{,}298.29$$

- Sell $ 3,42,298.29 at SR = $\frac{\$\ 3{,}42{,}298.29}{1.5905}$ = £ 2,15,214.27

- Invest £ 2,15,214.27 in UK Money Market @ 5% for 3 months

  Cash Inflows = £ 2,15,214.27 × [1 + (0.05 × 3/12)]

  = £ 2,17,904.44.

Money Market Cover is better due to higher cash Inflows.

Question – 38

Columbus Surgicals Inc. is based in US, has recently imported surgical raw materials from the UK and has been invoiced for £ 480,000, payable in 3 months. It has also exported surgical goods to India and France.

The Indian customer has been invoiced for £ 138,000, payable in 3 months, and the French customer has been invoiced for € 590,000, payable in 4 months.

Current spot and forward rates are as follows:

£ / US$

Spot:	0.9830 – 0.9850
Three months forward:	0.9520 – 0.9545

US$ / €

Spot:	1.8890 – 1.8920
Four months forward:	1.9510 – 1.9540

Current money market rates are as follows:

UK:	10.0% – 12.0% p.a.
France:	14.0% – 16.0% p.a.
USA:	11.5% – 13.0% p.a.

You as Treasury Manager are required to show how the company can hedge its foreign exchange exposure using Forward markets and Money markets hedge and suggest which the best hedging technique is.

(SM TYK – 38)

Solution:

- Import from UK & £ 4,80,000 payable in 3 months.
- Export to India & £ 1,38,000 receivable in 3 months hence netting is possible.

Net £ Payable to UK party = (£ 4,80,000 – £ 1,38,000)

= £ 3,42,000

We have to hedge for £ 3,42,000

Payable £ 3,42,000

(i) Forward Cover

Buy £ 3,42,000 at 3 months FR

$$\frac{£\ 3,42,000}{0.9520} = \$\ 3,59,243.70$$

(ii) Money Market Cover

- Amount to be invested in UK money market @ 10% p.a. for 3 months

$$\frac{£\ 3,42,000}{1+(0.10\times 3/12)} = £\ 3,33,658.54$$

- $ required to buy £ 3,33,658.54 at SR

$$\frac{£\ 3,33,658.54}{0.9830} = \$\ 3,39,428.83$$

- Borrow $ 3,39,428.83 from US money market @ 13% p.a. for 3 months.

Cash Outflow

$$\$\ 3,39,428.83 \times \left[1 + 0.13 \times \frac{3}{12}\right] = \$\ 3,50,460.27$$

Money Market Cover in better due to lower cash outflow.

Hedging of receivable € 5,90,000

(i) Forward Cover

Sell € 5,90,000 at 3 months FR

Cash Inflows = € 5,90,000 × 1.9510

= $ 11,51,090

(ii) Money Market Cover

- Amount to be borrowed from France money market @ 16% p.a. for 4 months

$$\frac{€\ 5,90,000}{1 + (0.16 \times 4/12)} = €\ 5,60,126.58$$

- Sell € 5,60,126.58 at SR

€ 5,60,126.58 × 1.8890 = $ 10,58,079.11

- Invest $ 10,58,079.11 in US money market @ 11.5% for 4 months

Cash Inflows = $ 10,58,079.11 × [1 + (0.115 × 4/12)]

= $ 10,98,638.81

Forward cover is better due to higher cash inflows.

Question – 39

An Indian exporting firm, Rohit and Bros., would be covering itself against a likely depreciation of pound sterling. The following data is given:

Receivables of Rohit and Bros	:	£500,000
Spot rate	:	₹ 56.00/£
Payment date	:	3-months
3 months interest rate	:	India : 12 per cent per annum
	:	UK : 5 per cent per annum

What should the exporter do?

(SM TYK – 28)

Solution:

Exporter should hedge with money market cover

- Amount to be borrowed from UK money market @ 5% p.a. for 3 months

$$\frac{£\ 5{,}00{,}000}{1 + (0.05 \times 3/12)} = £\ 4{,}93{,}827.72$$

- Sell £ 4,93,827.72 at SR = £ 4,93,827.72 × 56 = ₹ 2,76,54,352

- Invest ₹ 2,76,54,352 in Indian money market @ 12% p.a for 3 months

  ₹ 2,76,54,352 × [1 + (0.12 × 3/12)] = ₹ 2,84,83,982.

Question – 40

H Ltd. is an Indian firm exporting handicrafts to North America. All the exports are invoiced in US$. The firm is considering the use of money market or forward market to cover the receivable of $ 50,000 expected to be realized in 3 months time and has the following information from its banker:

	Exchange Rates
Spot	₹/$ 72.65/73
3 – months forward	₹/$ 72.95/73.40

The borrowing rates in US and India are 6% and 12% p.a. and the deposit rates are 4% and 9% p.a. respectively.

(i) Which option is better for H Ltd?

(ii) Assume the H Ltd. anticipates the spot exchange rate in 3 – months time to be equal to the current 3 – months forward rate. After 3 – months the spot exchange rate turned out to be ₹/$: 73/73.42.

What is the foreign exchange exposure and risk of H Ltd.?

(Exam November – 2019) (8 Marks)

Solution:

(i) Option 1: Forward Cover