

FOREX CLASS 20

HOME WORK SUPPORT

COVERAGE

Question			Answer			Lecture Time
Q. No	Page no.	Book	Q. No	Page no.	Book	
33	14	HW Q BOOK	33	23	HW ANS BOOK	00:00:33 - 00:03:10
34	14	HW Q BOOK	34	24	HW ANS BOOK	00:03:11 - 00:15:58
35	14	HW Q BOOK	35	24	HW ANS BOOK	00:15:59 - 00:17:37
36	15	HW Q BOOK	36	24	HW ANS BOOK	00:17:38 - 00:19:16
37	15	HW Q BOOK	37	25	HW ANS BOOK	00:19:17 - 00:33:16
38	15	HW Q BOOK	38	25	HW ANS BOOK	00:33:17 - 00:49:21
EXTRA Q1	69	HW ANS. BOOK	EXTRA Q1	69	HW ANS BOOK	00:49:22 - 00:52:04
EXTRA Q2	70	HW ANS. BOOK	EXTRA Q2	70	HW ANS BOOK	00:52:05 - 00:54:57

PART IV: INTERNATIONAL PARITY CONDITIONS

Topic 18 COVERED INTEREST ARBITRAGE

Question 33: SSEI HW Book Page No. 14

Spot rate 1 US \$ = ₹ 48.0123

180 days Forward rate for 1 US \$ = ₹ 48.8190

Annualised interest rate for 6 months – Rupee = 12%

Annualised interest rate for 6 months – US \$ = 8%

Is there any arbitrage possibility? If yes how an arbitrageur can take advantage of the situation, if he is willing to borrow ₹ 40,00,000 or US \$83,312.

(Source: ICAI)

ANSWER:

Spot Rate = ₹40,00,000 /US\$83,312 = 48.0123

Forward Premium on US\$ = $[(48.8190 - 48.0123)/48.0123] \times 12/6 \times 100$
= 3.36%

Interest rate differential = 12% - 8% = 4%

Since the negative Interest rate differential is greater than forward premium there is a possibility of arbitrage inflow into India.

The advantage of this situation can be taken in the following manner:

1. Borrow US\$ 83,312 for 6 months
Amount to be repaid after 6 months
= US \$ 83,312 (1+0.08 x 6/12) = US\$86,644.48
2. Convert US\$ 83,312 into Rupee and get the principal i.e. ₹40,00,000
Interest on Investments for 6 months – ₹40,00,000/- x 0.06 = ₹2,40,000/-
Total amount at the end of 6 months = ₹(40,00,000 + 2,40,000) = ₹42,40,000/-
Converting the same at the forward rate= ₹42,40,000/ ₹48.8190= US\$ 86,851.43
Hence the gain is US \$ (86,851.43 – 86,644.48) = US\$ 206.95
OR
₹10,103 i.e., (\$206.95 x ₹48.8190)

PART IV: INTERNATIONAL PARITY CONDITIONS

Topic 18 COVERED INTEREST ARBITRAGE

Question 34: SSEI HW Book Page No. 14

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?

(Source: ICAI)

ANSWER:

In this case, DM is at a premium against the Can\$

$$\text{Premium} = [(0.67 - 0.665) / 0.665] \times (12/3) \times 100 = 3.01 \text{ per cent}$$

$$\text{Interest rate differential} = 9\% - 7\% = 2 \text{ per cent.}$$

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

- i. Borrow Can\$ 1000 at 9 per cent for 3- months;
- ii. Change this sum into DM at the spot rate to obtain DM
= $(1000/0.665) = 1503.76$
- iii. Place DM 1503.76 in the money market for 3 months to obtain a sum of DM

Principal:	1503.76
Add: Interest @ 7% for 3 months	26.32
Total	1530.08

- iv. Sell DM at 3-months forward to obtain Can\$= $(1530.08 \times 0.67) = 1025.15$
- v. Refund the debt taken in Can\$ with the interest due on it, i.e.,

	Can\$
Principal	1000.00
Add: Interest @9% for 3 months	22.50
Total	1022.50

$$\text{Net arbitrage gain} = 1025.15 - 1022.50 = \text{Can\$ } 2.65$$

PART IV: INTERNATIONAL PARITY CONDITIONS

Topic 18 COVERED INTEREST ARBITRAGE

Question 35: SSEI HW Book page No. 14

Spot rate 1 US \$	= Rs.47.7123
180 days Forward rate for 1 US \$	= Rs.48.6690
Interest rate in India	= 12% p.a
Interest rate in USA	= 8% p.a

An arbitrageur takes loan of Rs.40,00,000 from Indian Bank for 6 months and goes for arbitrage. What is his gain or loss ? (Take 1 year = 360 days)

(Source: ICAI)

ANSWER:

Amount he receives in dollar = $40,00,000 / 47.7123$	\$ 83,835.82
Interest earned by him @ 8%	\$ 33,53.43
Net Amount received by him after six months	\$ 87,189.25
After conversion he will receive in Rupees @ Rs.48.6690	Rs.42,43,414
Amount to be paid to Indian Banker with interest for six months	Rs.42,40,000
Gain to the arbitrageur	Rs.3,414

PART IV: INTERNATIONAL PARITY CONDITIONS

Topic 18 COVERED INTEREST ARBITRAGE

Question 36: SSEI HW Book Page No. 15

Following information is given:

Exchange rates: Canadian dollar 0.666 per DM (spot)

Canadian dollar 0.671 per DM (3-months)

Interest rates: DM 7.5% p.a.

Canadian Dollar - 9.5% p.a.

To take the possible arbitrage gains, what operations would be carried out?

(Source: ICAI)

ANSWER:

In this case, DM is at a premium against the Can\$.

$$\text{Premium} = [(0.671 - 0.666) / 0.666] \times (12/3) \times 100 = 3.00 \text{ per cent}$$

$$\text{Interest rate differential} = 9.5\% - 7.5\% = 2 \text{ per cent.}$$

Since the interest rate differential is smaller than the premium, it will be profitable to place money in Deutschmarks the currency whose 3-months interest is lower.

The following operations are carried out:

- i. Borrow Can\$ 1000 at 9.5 per cent for 3- months;
- ii. Change this sum into DM at the spot rate to obtain DM
= $(1000/0.666) = 1501.50$
- iii. Place DM 1501.50 in the money market for 3 months to obtain a sum of DM

Principal:	1501.50
Add: Interest @ 7.5% for 3 months =	28.15
Total	1529.65

- iv. Sell DM at 3-months forward to obtain Can\$= $(1529.65 \times 0.671) = 1026.40$

- v. Refund the debt taken in Can\$ with the interest due on it, i.e.,

	Can\$
Principal	1000.00
Add: Interest @ 9.5% for 3 months	23.75
Total	1023.75

$$\text{Net arbitrage gain} = 1026.40 - 1023.75 = \text{Can\$ } 2.65$$

Note: The students may use any quantity of currency to arrive at the arbitrage gain since no specific amount is mentioned in the question.

PART IV: INTERNATIONAL PARITY CONDITIONS

Topic 18 COVERED INTEREST ARBITRAGE

Question 37: SSEI HW Book Page No. 15

Following are the rates quoted at Bombay for British pound:

BP/₹	52.60/70	Interest Rates	India	London
3 m Forward	20/70	3 months	8%	5%
6 m Forward	50/75	6 months	10%	8%

Verify whether there is any scope for covered interest arbitrage if you borrow rupees.

(Source: ICAI)

ANSWER:

Particulars	Option I (3 months)	Option II (6months)
Amount borrowed	100000	100000
Pound obtained by converting at spot rate	$100000/52.70 = 1897.53$	$100000/52.70 = 1897.53$
Invest pound for the period	1.25%	4%
Amount of pound received at the end Of the period	$1897.53 \times 1.0125 = 1,921.25$	$1897.53 \times 1.0 = 1,973.43$
Convert pounds to ₹ At forward rate	$1,921.25 \times 52.80 = 1,01,442$	$1,973.43 \times 53.10 = 1,04,789$
Amount of Re. Loan to be repaid	$100000 \times 1.02 = 102000$	$100000 \times 1.05 = 105000$

As the amount of Re. Received is less than the amount repaid there is no scope for covered interest arbitrage.

PART IV: INTERNATIONAL PARITY CONDITIONS

Topic 18 COVERED INTEREST ARBITRAGE

Question 38: SSEI HW Book Page No. 15

Spot rate 1 US\$ = ₹ 68.50

USD premium on a six month forward is 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.

(Source: FOD)

ANSWER:

Spot Rate = ₹68.50

Forward Rate = ₹ 68.50 x 1.03 = ₹ 70.56

Forward Premium on US\$ = 3.00% x 12/6 = 6.00%

Interest rate differential = 9% - 4% = 5%

Since the Interest rate differential is less than forward premium there is a possibility of arbitrage outflow from India.

The advantage of this situation can be taken in the following manner:

i. Borrow equivalent amount of US\$ 3000000 in India for 6 months at Spot Rate

₹ 68.50 x US\$ 3000000 = ₹ 20,55,00,000

Amount to be repaid after 6 months

= ₹ 20,55,00,000 (1 + 0.09 x 6/12) = ₹ 21,47,47,500

ii.

Convert ₹ 20,55,00,000 into US\$ and get the principal i.e.	US\$ 30,00,000
Interest on Investments for 6 months – US\$ 3000000 x 0.02	US\$ 60,000
Total amount at the end of 6 months = US\$ (30,00,000+60,000)	US\$ 30,60,000

Converting the same at the forward rate

= US\$ 30,60,000 x ₹ 70.56 = ₹ 21,59,13,600

Hence the gain is ₹ (21,59,13,600 – 21,47,47,500) = ₹ 11,66,100

or

₹ 11,66,100/ ₹ 70.56 = US\$ 16,526

PART IV: INTERNATIONAL PARITY CONDITIONS

EXTRA QUESTION

Topic 18 COVERED INTEREST ARBITRAGE

Question: HW ANS BOOK PAGE 69

The spot exchange rate between AUD and USD is 1AUD = 0.63 USD and the risk free rate of interest rate in Australia is 6% p.a. and in USA is 4% p.a. If the interest is compounded on a daily basis find out the 2 year forward rate such that there is no arbitrage opportunity.

Further, show how an investor could make risk-less profit, if two year forward price is 1AUD=0.69 USD. Given $e^{0.04} = 1.0408$ & $e^{-0.08} = 0.9231$, $e^{-0.12} = 0.8869$, $e^{0.12} = 1.1275$

(Source: FOD)

ANSWER:

2 year Forward Rate will be calculated as follows:

$$F = S \times e^{(r_{usa}-r_{aus})t}$$

Where F = Forward Rate

S = Spot Rate

rUSA = Risk Free Rate in USA

rAUS = Risk Free Rate in Australia

t = Time

Accordingly,

$$\begin{aligned} F &= 0.63e^{(0.04 - 0.06)2} \\ &= 0.63 \times 0.9608 \\ &= 0.6053 \end{aligned}$$

Thus,

$$1 \text{ AUD} = 0.6053 \text{ USD}$$

If forward rate is 1 AUD = 0.69 USD then an arbitrage opportunity exists. Take following steps.

- a. Should borrow USD
- b. Buy AUD
- c. Enter into a short forward contract on AUD

Accordingly,

The riskless profit would be

- Say borrow USD $0.6053e^{-(0.04)(2)} = 0.5588$ and invest in USA for 2 years.
- Now buy AUD at AUD $1e^{-(0.06)2} = \text{AUD}0.8869$, so that after two year it can be used to close out the position.
- After two year the investment in AUD will become $\text{AUD } 0.8869e^{(0.06)(2)} = \text{AUD } 0.8869 \times 1.1275 = 1 \text{ AUD}$
- Sell this AUD for 0.69USD and repay loan of USD0.5588 along with interest i.e USD 0.6053. Thus arbitrage profit will be $0.69 - 0.6053 = 0.0847 \text{ AUD}$.

ALTERNATE SOLUTION TO FIND ARBITRAGE PROFIT

- STEP 1:** Borrow \$ 1,00,000 @ 4% p.a. for 2 years
Outflow after 2 years $1,00,000 \times e^{(0.04 \times 2)} = \$ 1,08,328.71$
- STEP 2:** Sell \$ 1,00,000 spot @ 0.63 USD/AUD getting $1,00,000 / 0.63 = 1,58,730.16 \text{ AUD}$
- STEP 3:** Invest AUD @ 6% for 2 years
 $1,58,730.16 \times e^{(0.06 \times 2)} = 1,78,967.76 \text{ AUD}$
- STEP 4:** Sell 2 year forward @ 0.69 getting $1,78,967.76 \times 0.69 = \$ 1,23,487.75$

Arbitrage profit = $1,23,487.75 - 1,08,328.71 = 15,159 \$$

PART IV: INTERNATIONAL PARITY CONDITIONS

EXTRA QUESTION

Topic 18 COVERED INTEREST ARBITRAGE

Question: **HW ANS BOOK PAGE 70**

Given

Spot ₹/£ 89.40/90.30

3m F ₹/£ 91.70/92.90

3m interest(P.a.)

₹ 9%/10%

£ 3%/4%

- i. Check whether there is a CIA opportunity if you start by borrowing ₹ 1,00,000.
- ii. Check whether there is a CIA opportunity if you start by borrowing £ 1,00,000.
- iii. Find out the limits for the 3m forward rate to prevent CIA.

(Source: FOD)

ANSWER:

i. **STEP 1:** Borrow 1,00,000 INR @10% p.a. for 3 months

Outflow after 3 months = $1,00,000(1.025) = 1,02,500$

STEP 2: Convert 1,00,000 INR spot into GBP @ 90.30 getting $1,00,000/90.30 = 1107.42$ GBP

STEP 3: Invest 1107.42 GBP @3% FOR 3 MONTHS

Inflow after 3 months = $1107.42(1.0075) = 1115.73$ GBP

STEP 4: Sell 3 m forward GBP @ 91.70

Inflow after 3 months = $1115.73 \times 91.70 = 1,02,312$ INR

Since rupee inflow < rupee outflow, there is no CIA opportunity.

ii. **STEP 1:** Borrow 1,00,000 GBP @4% p.a. for 3 months

Outflow after 3 months = $1,00,000(1.01) = 1,01,000$ GBP

STEP 2: Convert 1,00,000 GBP spot into INR @ 89.40 getting $1,00,000 \times 89.40 = 89,40,000$ INR

STEP 3: Invest 89,40,000 @9% FOR 3 MONTHS

Inflow after 3 months = $89,40,000(1.0225) = 91,41,150$ INR

STEP 4: Sell 3 m forward INR @ 92.90

Inflow after 3 months = $91,41,150/92.90 = 98,397.74$ GBP

Since GBP inflow < GBP outflow, there is no CIA opportunity.

iii.

a. $F(\text{ask}) > F(\text{bid})$

b. $F(\text{ask})/S(\text{bid}) \geq [1 + r(\text{inr}, I) \times t] / [1 + r(\text{gbp}, B) \times t]$

$$F(\text{ask}) \geq 89.40 \times 1.0225/1.01$$

$$F(\text{ask}) \geq 90.5064$$

c. $F(\text{bid})/S(\text{ask}) \leq [1 + r(\text{inr}, B) \times t] / [1 + r(\text{gbp}, I) \times t]$

$$F(\text{bid}) \leq 90.30 \times 1.025/1.0075$$

$$F(\text{bid}) \leq 91.8684$$