

CURRENCY OPTIONS AND SWAPS

Topics Covered

- Currency Options
- Currency Swaps

Note to students:

Printed solution is not given for question no 7 and question no 8 – as they have been solved in detail in the video. So students are advised to refer to the solution provided in the video.



Currency options and swaps

Q.1 It is around February end and the spot \$/ £ rate is \$1.4/1£ . You are convinced that the £ will weaken by May end to about \$ 1.3 / £ 1. Sterling December put options with a strike price of \$ 1.39 are being traded at a premium of £ 500 per contract. The sterling contract size is £ 25000. You are required to work out possible pay offs if the spot rate at expiration is (a) \$1.30 (b) \$1.50 and (c) \$1.39

A.2

- Since we feel that pound is going to weaken we will be looking to sell £.
- Since £ put options are being traded we will buy the £ put option (i.e. the right to sell £)
- Buying a put will involve payment (outflow) of premium to the extent of £ 500 per contract.
- The pay off table can be calculated as below:

MP on expiry	Option exercise (Y/N)	Pay off in £	Pay off in \$
1 £ = \$1.30	Yes	£ 1230.77 (Note 1)	\$1550 (Note 2)
1 £ = \$1.39	No	(£ 500)	(\$700) (Note 3)
1 £ = \$1.50	No	(£ 500)	(\$700) (Note 3)

Note 1:

Profit on exercise = $(\$1.39 - \$1.30) \times 25000 = \$2250$

Profit in £ @ 1 £ = \$1.30 = $\$2250 / \$1.30 = \text{£ } 1730.77$

Less: Premium outflow (£ 500.00)

Net Profit £ 1230.77

Note 2:

Profit on exercise as computed above = \$2250

Less: Premium outflow in \$ = (\$700)

Net Profit = (\$1550)

Note 3:

\$ outflow to pay premium at spot rate of 1 £ = \$1.40 w.r.t £ 500 = \$700

Q.2 A company is tendering for the sale of equipment to a US company for \$ 3 million, settlement due in 3 months' time. The current spot rate is \$ 1.58 per 1 £. However, the company is worried about the dollar weakening against the Pound thus making the sale less profitable. The company has been offered a 3-month put option on US dollar at \$1.60 per £ 1 costing 2 cents per Pound. What is the total premium outflow?

A.2

The company has a receivable of \$30,00,000

Since the company is worried about dollar weakening, it will be looking to sell \$ (or Buy £)

Since put options on \$ (i.e. right to sell \$) are being traded the company will buy the put option on dollars.

This will involve a premium outflow of 2 cents per pound. Hence we need to find the number of £ involved in the transaction of \$30,00,000 @ the strike price of 1 £ = \$1.60 which amounts to £ 18,75,000. Hence total premium outflow = £ 18,75,000 x \$0.02 = \$37500.

Q.3 Hesse international plc has recently purchased a consignment of cleaning fluid from a United States supplier for \$ 3,00,000 payable in 3 months' time. Recently the company has experienced foreign exchange losses on similar deals and the financial director has decided that henceforth all transaction exposure will be covered. After discussion with the bank the following data have been made available:

Foreign exchange market

	\$ / £
Spot rate	1.5000 - 1.5050
3 month forward premium on \$	1.00 - 0.80 cents

Money Market

Base rates are 18% per annum both in UK and USA.

Hesse can borrow at 2% above and deposit at 2% below the relevant base rate in either countries

Option

The Bank has offered a call option on \$300000 at an exercise price of \$ 1.49 / £ at a cost of £ 3000 payable in arrears.

The financial director is also aware that transaction exposure may be hedged by the use of financial futures exchanges but is uncertain of the advantages they offer as exposed to services offered by banks.

You are required:

- (a) To calculate the net cost of the transaction assuming it was covered in:
 - (i) The forward foreign exchange market.
 - (ii) The money market
- (b) To explain to the financial director the nature of the foreign exchange risk cover provided by the call option and calculate the exact future spot rate at which the option would start to give a cheaper cost than the forward contract

A.3 The company has a payable of \$3,00,000 due in 3 months time.

a. Forward market hedge

Total £ outflow if the transaction was covered in forward market @ 1 £ = 1\$1.49 (refer Note 1 below) will be \$30,00,000 / 1.49 = £ 201342.

Note 1:

Spot rate = 1 £ = \$1.5000 / \$1.5050

3 month swap = 1.00 / 0.80 cents

3 month forward rate 1 £ = \$1.49 / \$1.4970

Since the company is looking to buy \$ (i.e. sell £) the applicable rate for selling £ will be 1 £ = \$1.49

b. Money Market Hedge

Since the company has a dollar payable to create a MMH it needs to invest in dollars.

Amount to be invested in dollars = PV of \$300,000 @ 16% p.a. for 3 months
= \$ 288461.54

Currency options and swaps

£ outflow to buy \$288461.53 at spot rate of 1 £ = \$1.50 = £ 192307.69
 Add: interest @ 20% p.a. for 3 months = £ 9615.38
 Total £ outflow under money market hedge = £ 201923.07

Conclusion : Hence Forward cover is a better option as it results in lower £ outflow

Options:

The exact spot rate at which the option will give a better rate than forward:

MP on expiry	Exercise (Y/N)	Outflow in fwd	Outflow - option	
1 £ = \$1.47	Yes	£ 201342	(300000/1.49)+3000	£ 204342
1 £ = \$1.48	Yes	£ 201342	(300000/1.49)+3000	£ 204342
1 £ = \$1.49	No	£ 201342	(300000/1.49)+3000	£ 204342
1 £ = \$1.50	No	£ 201342	(300000/1.50)+3000	£ 203000
1 £ = \$1.51	No	£ 201342	(300000/1.51)+3000	£ 201675
1 £ = \$1.52	No	£ 201342	(300000/1.52)+3000	£ 200368
1 £ = \$1.53	No	£ 201342	(300000/1.53)+3000	£ 199078

Hence break even point will lie somewhere between 1 £ = \$1.51 and 1 £ = \$1.52 and can be found as under:

$$201342 = (3,00,000/x) + 3000$$

X = 1.5125. Hence for all rates below 1 £ = \$1.5125 forward will be better and for all rates above 1 £ = \$1.5125 options will be better

Q.4 XYZ Ltd a US firm will need £ 3,00,000 in 180 days. In this connection the following information is available:

Spot 1 £ = \$2.00

180 day forward rate of £ as of today = \$1.96

Interest rates are as follows:

	UK	US
180 day deposit rate	4.5%	5%
180 day borrowing rate	5%	5.5%

A call option of £ that expires in 180 days has an exercise price of \$1.97 and a premium of \$0.04. XYZ Ltd has forecast the spot rates 180 days hence as below:

Future rate	Probability
\$1.91	25%
\$1.95	60%
\$2.05	15%

Which of the following strategy would be most preferable to XYZ Ltd:

- (a) Forward market
- (b) Money market hedge
- (c) Option contract
- (d) No hedging

Show calculation in each case.

A.4 XYZ will be looking to buy £ 300000 in 6 months time. We need to find out the strategy which will result is least dollar outflow to buy £ 300000.

a. Forward Contract:

Dollar outflow to buy £ 300,000 at forward rate of 1 £ = \$1.96 = \$588,000

b. Money Market Hedge

Since we have a £ payable to create a money market hedge we need to invest in pounds.

Amount to be invested = PV of £ 300,000 @ 4.5% p.a. for 6 months
= £ 293399

Dollar outflow to buy £ 293399 at spot rate of 1 £ = 2\$ = \$586798

Add: Interest @ 5.5% p.a for 6 months = \$16137

Total outflow under money market hedge = \$602935

c. Option contract

MP on expiry	Exercise (Y/No)	Cost	premium	Total cost	Total outflow	probability	Expected outflow
1 £ = \$1.91	No	1 £ = \$1.91	\$0.04	1 £ = \$1.95	\$585000	0.25	\$146250
1 £ = \$1.95	No	1 £ = \$1.95	\$0.04	1 £ = \$1.99	\$597,000	0.60	\$358200
1 £ = \$2.05	Yes	1 £ = \$1.97	\$0.04	1 £ = \$2.01	\$603000	0.15	\$90450
				Total outflow			\$ 594900

d. No Hedging:

If no hedge taken then outflow will take place at the rate prevailing on the maturity date i.e
(1 £ = \$1.91 x 0.25 + \$1.95 x 0.60 + \$2.05 x 0.15) = \$ 1.955 i.e. £ 300000 x 1.955 = \$586500

Conclusion:

No hedge is the best option as it has the least dollar outflow.

Q.5 Best of Luck Ltd, London will have to make a payment of \$ 364,897 in six months time. It is currently October 1. The company is considering the various choices it has in order to hedge its transaction exposure.

Exchange Rate:

Spot rate \$ 1.5617 - 1.5773

6 month forward rate \$ 1.5455 - 1.5609

Money Market Interest rates p.a

	Borrow (%)	Deposit (%)
US	6	4.5
UK	7	5.5

Foreign Currency option price (1 unit is British Pound 12500)

Exercise Price	Call option (March)	Put Option (March)
\$ 1.70	\$ 0.037	\$ 0.096

By making the appropriate calculations and ignoring the time values of money (in case of premiums) decide which of the following hedging option is most attractive:

- Forward Market
- Cash (Money) market
- Currency Options.

A.5 The company has a payable of \$364897 which is due in 6 months.

a. Forward Market

The £ outflow if forward cover is taken at 1 £ = \$ 1.5455 with respect to \$364897 will be
 = \$364897/1.5455 = £ 236103

b. Money Market Hedge

Since the company has a dollar payable to create a money market hedge it needs to invest in dollars.

Amount to be invested = PV of \$364897 @ 4.5% p.a. for 6 months
 = \$356850

£ outflow to buy \$356850 at spot rate of 1 £ = \$1.5617 will be £ 228501

Add: Interest cost @ 7% p.a for 6 months £ 7998

Total £ outflow under Money Market Hedge £ 236499

c. Options

Since the company has a dollar payable it will be looking to buy dollars (or sell £).

Since the options being traded are pound options it will buy put options on pound with a strike price of 1 £ = \$1.70 and pay premium of \$0.076 per £.

To find the amount of premium to be paid we need to find the quantum of pounds involved in a payable of \$364897 at the strike price of 1 £ = \$1.70 i.e. £ 214645.

Lot size £ 12500

No of lots (£ 214645/12500) 17.1716 lots

So it will buy 17 lots and for the remaining 0.1716 it will enter into a forward cover to buy \$ 3646.50 (Refer Note 1 below) at 1 £ = \$1.5455.

Hence the total maximum outflow under options will be:

- | | |
|--|----------|
| a. Put options | £ 212500 |
| b. Premium | |
| 212500 x 0.076 = \$16150 which at spot rate of | |
| 1 £ = \$1.5617 amounts to | £ 10341 |
| c. Forward cover | £ 2359 |
| d. Interest on Premium | £ 362 |
| Total outflow | £ 225562 |

Note 1

Total exposure value	£ 214645
Less: Covered by options 17 x 12500	£ 212500
Balance uncovered	£ 2145
Which reconverted at 1 £ = \$1.70 amounts to \$ 3646.5	

Q.6 Zaz plc, a UK Company is in the process of negotiating an order amounting €2.8 million with a large German retailer on 6 month's credit. If successful, this will be first time for Zaz has exported goods into the highly competitive German Market. The Zaz is considering following 3 alternatives for managing the transaction risk before the order is finalized.

1. Mr. Peter the Marketing head has suggested that in order to remove transaction risk completely Zaz should invoice the German firm in Sterling using the current €/£ average spot rate to calculate the invoice amount.
2. Mr. Wilson, CE is doubtful about Mr. Peter's proposal and suggested an alternative of invoicing the German firm in € and using a forward exchange contract to hedge the transaction risk.
3. Ms. Karen, CFO is agreed with the proposal of Mr. Wilson to invoice the German first in €, but she is of opinion that Zaz should use sufficient 6 month sterling further contracts (to the nearest whole number) to hedge the transaction risk.

Following data is available

Spot Rate	€ 1.1960 - €1.1970/£
6 months forward points	0.60 – 0.55 Euro Cents.
6 month further contract is currently trading at	€ 1.1943/£
6 month future contract size is	£62,500
After 6 month Spot rate and future rate	€ 1.1873/ £

You are required to

- a. Calculate (to the nearest £) the £ receipt for Zaz plc, under each of 3 above proposals.
- b. In your opinion which alternative you consider to be most appropriate.

A.6 (a) Proposal of Mr Peter:

Invoicing in £ will produce : $€ 2.8 \text{ m} \div 1.1965 = £ 2.340 \text{ million}$

(b) Proposal of Mr Wilson:

Forward rate = $€ 1.1970 - 0.0055 = 1.1915$

Using forward Market hedge, Sterling receipt would be $€ 2.8\text{m} \div 1.1915 = £ 2.35 \text{ million}$.

(c) Proposal of Ms. Karen

Invoice value of receivable = € 2.8 million

Since the futures being traded are £ futures we will buy the £ futures.

To find the number of £ futures to be purchased we first need to ascertain the amount of £ 's involved in € 2.8 million at the futures price of 1 £ = € 1.1943 i.e. $€ 2.8 \text{ million} \div 1.1943 = £ 2,344,470$ (rounded off).

∴ no of contracts to be purchased = $£ 2,344,470 \div 62500 = 37$ contracts (to the nearest whole number).

Thus € amount hedged by future contract will be = $37 \times £ 62500 = £ 23,12,500$.

Day 1
 Buy 37 lots of £ futures @ 1 £ = € 1.1943
 Day 180
 Sell 37 lots of £ futures @ 1 £ = € 1.1873
 Loss on futures per £ = € 0.0070
 Hence total loss on futures = 37 x £ 62500 x 0.0070 = € 16,188.
 Amount received on exports = € 28,00,000
 Hence net receipt on export = € 27,83,812
 Net £ inflow obtained by selling € 27,83,812 @ 1 £ = € 1.1873 = £ 2.3446 million.

Proposal of option (b) is preferable because the option (a) and (c) produces lower receipts. Further in case of proposal (a) there is always a question mark whether this would be acceptable to German firm as it is described as a competitive market and Zaz is moving into it for the first time – so it might not have the negotiating power to demand such invoicing.

- Q.7 Apple Inc, a US based Company wishes to lend \$500,000 to its Japanese subsidiary. At the same time Toyota Motors , a Japan based company, is interested in making a medium term loan of approximately the same amount to its USA subsidiary. The two parties are brought together by an investment bank for the purpose of making parallel loans. Apple Inc will lend \$500,000 to the US subsidiary of Toyota Motors for 4 years at 13%. Principal and interest are payable only at the end of the fourth year with interest compounding annually. Toyota motors will lend the Japanese subsidiary of Apple Inc 70 million Yen for 4 years at 10%. Again the principal and interest (annual compounding) are payable at the end. The current exchange rate is 140 Yen to the \$.
- However the dollar is expected to decline by 5 Yen to the Dollar per year over the next 4 years .
- If these expectations prove to be correct what will be the dollar equivalent of principal and interest payments to Toyota Motors at the end of 4 years .
 - What total dollars will Apple Inc receive at the end of 4 years from the payment of principal and interest on its loan by the US subsidiary of Toyota Motors .
 - Which party is better off with the parallel loan arrangement. What would happen if the yen did not change in value.

- Q.8 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:

Company	¥ Loan	\$ Loan
A Inc	5%	9%
B Inc	8%	10%

The prevalent exchange rate is \$1 = ¥120

They entered into a currency swap under which it is agreed that B Inc will pay A Inc at 1% over the ¥ Loan interest rate which the latter will have to pay as a result of the agreed currency swap whereas A Inc will reimburse interest to B Inc only to the extend of 9% keeping the exchange rate invariant. Quantify the opportunity gain or loss component of the ultimate outcome, resulting from the designed currency swap.