

CHAPTER 35

Solved Problems

P.35.18 Prepare a table of the profit profile of the buyer of a call option with the following information:

Current spot rate	Rs 51.49/€
Exercise price	52.10/€
Call premium	2 per cent

Solution The profit resulting from a call option is given by the following equation

$$\text{Profit} = S_T - X - C \text{ for } S_T > X = -C \text{ for } S_T < X$$

Where S_T is current spot rate (Rs 51.49/€), X is exercise price (Rs 52.10/€) and C is call premium (2 per cent).

Let us assume that the amount is € 1. So, the amount of the premium to be paid up-front is (Rs 1 × 0.02 × Rs 51.49) = Rs 1.0298.

The call option will be exercised if the spot rate (S_T) on the date of exercise is more than Rs 52.10. Otherwise, it will be allowed to lapse. The reason is that at an exchange rate lower than Rs 52.10, it will be profitable to buy from the spot market itself. The table below contains the profit data corresponding to various S_T values.

	S_T (Rs/€)	Option value	Premium already paid	Net profit
1	49.0	0.00	Rs 1.0298	(-) Rs 1.0298
2	50.0	0.00	1.0298	-1.0298
3	51.0	0.00	1.0298	-1.0298
4	51.49	0.00	1.0298	-1.0298
5	52.10	0.00	1.0298	-1.0298
6	53.0	0.90	1.0298	-0.1298
7	54.0	1.90	1.0298	+0.8702
8	55.0	2.90	1.0298	+1.8702
9	56.0	3.90	1.0298	+2.8702

P.35.19 For a value date of 1 July 2000, a company entered into a five year interest rate swap with its bank under which it has contracted to pay 9 per cent and receive a six month MIBOR, settled semi-annually, on a principal amount of Rs 1,00,00,000. On 1 July of the current year, with the swap payment of exactly three years is remaining, the bank offers to unwind the swap at the rate of 6.5 per cent. If the company agrees to the bank's offer, the transaction will be cancelled today by means of a settlement.

- (a) Set out the underlying fixed-rate cash flow that would take place if instead of canceling the existing deal a new deal were made and the two deals were to exist till maturity.
- (b) What sum of money would be paid today to cancel the transaction? And in case of cancellation who will pay to whom?
- (c) What assumptions are implicit in the above calculation?

Solution Under the old swap agreement the company is paying 4.5 per cent on Rs 1,00,00,000, every six months. But under the new swap agreement the swap rate is 3.25 per cent on Rs 1,00,00,000 every six months.

- (a) So, the fixed-rate cash flow that would take place if both the deals co-exist is
Rs 1,00,00,000 × (0.045 – 0.0325) = Rs 1,25,000 per six months.
- (b) The sum to be paid to cancel the transaction would be the present value of equivalent future cash flows of Rs 1,25,000 discounted at 3.25 per cent for every six month period = 1,25,000 [1/1.0325 + 1/(1.0325)² + 1/(1.0325)³ + 1/(1.0325)⁴ + 1/(1.0325)⁵ + 1/(1.0325)⁶] = Rs 1,25,000 × 5.3726 = Rs 6,71,575.

As the company will be enjoying these benefits due to the fall in interest rate, under the cancellation, the company will be paying this amount to the bank.

- (c) All the future cash flows have been discounted at same rate (3.25 per cent per six months). So it implicitly assumes that the yield curve is flat. If the yield curve were not flat then different discount rates should be applied to each cash flow.

P.35.20 In the year 1990 an Indian importer was required to pay Rs 21 to receive 1 US dollar. In the year 1997 it was Rs 31 and in the year 2002 the importer is required to pay Rs 48 to buy one dollar.

- (i) How much has the rupee appreciated or depreciated during 1990 – 1997 and between 1997 – 2002 *vis-à-vis* the US \$?
- (ii) What has been the corresponding appreciation/depreciation in the dollar during these periods, in relation to Indian rupee?

Solution Appreciation/depreciation in dollar terms:

Period 1990–97, appreciation = $\frac{31-21}{21} \times 100 = 47.62\%$

Period 1997–2002, appreciation = $\frac{48-31}{31} \times 100 = 54.84\%$

Appreciation/depreciation in rupee terms:

Period 1990–97, depreciation = $\frac{21-31}{31} \times 100 = 32.25\%$

Period 1997–2002, depreciation = $\frac{31-48}{48} \times 100 = 35.42\%$

35.21 Romesh Sharma is a currency trader for a large currency trading firm of US, based in New Jersey. He expects the US dollar to depreciate against the euro. The current spot rate of the euro is US \$1.0768/€ and the premium on call and put options are as follows:

<i>Strike: US \$1.1000/€</i>	<i>30 days</i>	<i>60 days</i>
Call option on the euro	0.085	0.100
Put option on the euro	0.110	0.135

- (a) What should Romesh Sharma do to profit from his anticipation?
- (b) What will the profit or loss be, if the rate on settlement date, after 30 days, is US \$1.220/€, and (i) Romesh Sharma has bought a 30 day call, (ii) Romesh Sharma has sold a 30 day put.

Solution

(a) As Romesh Sharma anticipates the US dollar to depreciate against the euro (appreciation of euro against the US dollar), he can be benefited either by buying a call option on euros or selling a put option on euros.

(b) (i) Profit from purchase of call

Profit from purchase of call for a strike price of US \$1.1000/€, premium US \$0.085/€ and settlement rate (expiration rate) of US \$1.220/€

$$= \text{US } \$ (1.220 - 1.1000)/€ - \text{US } \$ 0.085/€ = \text{US } \$ 0.035/€$$

As the settlement rate is higher than the strike rate, Romesh Sharma will exercise the option.

(ii) Profit from sell of put

As the settlement rate (US \$1.220/€) is higher than the strike rate, this put option will not be exercised. So, for Romesh Sharma the premium that he received on selling (writing) the put option is his profit (US \$0.110/€).

Selling an option entails high risk, but is used as a strategy by the currency trader when he is confident of his anticipation.