

# Chapter Tests of SFM of CA Ashish Lalaji 9825856155

## Solution of Test of Options

**Q 1**

**(a)**

Spot Price is Rs.105.

Investor wants 7% return p.a. in 3 months

$$\begin{aligned}
 \text{Expected MPS after 1 year} &= Se^{rt} \\
 &= 105e^{0.07(3/12)} \\
 &= 105e^{0.0175} \\
 &= 105 (1.0177*) \\
 &= \text{Rs.106.8585}
 \end{aligned}$$

*	0.0225	1.023		?	=	-----		0.0150	1.015
	<u>0.0150</u>	<u>1.015</u>				0.0025 X 0.008		<u>0.0025</u>	<u>0.0027</u>
	<u>0.0075</u>	<u>0.008</u>				0.0075		<b><u>0.0175</u></b>	<b><u>1.0177</u></b>
	<u>0.0025</u>	?				= 0.0027			

Let probability of share price rising to Rs.110 be 'p', then that of falling to Rs.90 is '1 - p'.

$$110p + 90(1 - p) = 106.8585$$

$$110p + 90 - 90p = 106.8585$$

$$p = \frac{106.8585 - 90}{110 - 90}$$

$$= \frac{16.8585}{20}$$

$$= 0.8429$$

$$1 - p = 1 - 0.8429 = 0.1571$$

Value of Call is -

Expected MPS	Strike Price	Value of Call	Pi	Expected Value
110	100	10	.8429	8.429
90	100	0	.1571	0
				<b>8.429</b>

Value of

$$\begin{aligned}
 \text{Call as on} &= \text{PV of Rs.8.429} \\
 \text{today} &= 8.429e^{-rt} \\
 &= 8.429e^{-0.07(3/12)} \\
 &= 8.429e^{-0.0175} \\
 &= 8.429 \times 1 / 1.0177 \\
 &= \text{Rs.8.28}
 \end{aligned}$$

**(b) Determination of Parameters of BSM:**

$$\begin{aligned}d_1 &= \frac{\ln(S/E) + (r + 0.5 \sigma^2) t}{\sigma \sqrt{t}} \\&= \frac{\ln(80/75) + [0.12 + 0.5 (.4)^2] 6/12}{0.4 \sqrt{6/12}} \\&= \frac{\ln 1.0667 + 0.1}{0.2828} \\&= \frac{0.0646 + 0.1}{0.2828} \\&= 0.5820\end{aligned}$$

$$\begin{aligned}d_2 &= d_1 - \sigma \sqrt{t} \\&= 0.5820 - 0.2828 \\&= 0.2992\end{aligned}$$

$$\begin{aligned}N(d_1) &= N(0.5820) = N(0.55) + N(0.032) \\&= 0.7088 + 0.0108^* \\&= 0.7196\end{aligned}$$

\*

0.60:	0.7257	(1 - 0.2743**)	(**0.5486 / 2)
0.55:	0.7088	(1 - 0.2912***)	(***0.5824 / 2)
0.05:	0.0169		
0.032:	?	=	0.0108

$$\begin{aligned}N(d_2) &= N(0.2992) = N(0.25) + N(0.0492) \\&= 0.5987 + 0.0189^* \\&= 0.6176\end{aligned}$$

\*

0.30:	0.6179	(1 - 0.3821**)	(**0.7642 / 2)
0.25:	0.5987	(1 - 0.4013***)	(***0.8026 / 2)
0.05:	0.0192		
0.0492:	?	=	0.0189

$$e^{-rt} = e^{-0.12(6/12)} = e^{-0.006} = 1 / 1.062 = 0.9416$$

**Valuation of Call Option:**

$$\begin{aligned}C_0 &= S N(d_1) - E e^{-rt} N(d_2) \\&= 80 (0.7196) - 75 (0.9416) (0.6176) \\&= \text{Rs.}13.95\end{aligned}$$

Solution prepared by **CA. Ashish Lalaji**

**Q 2****(a) Determination of Net Pay-off for Strap:**

Spot Price on maturity	48	36
Strike Price:		
2 Long Call	42	42
1 Long Put	42	42
Gross Pay Off:		
2 Long Call	12	0
1 Long Put	0	6
	12	6
Premium paid	8	8
[(3 X 2) + 2]		
<b>Net Pay off</b>	<b>4</b>	<b>(2)</b>

**Determination of Net Pay-off for Strip:**

Spot Price on maturity	48	36
Strike Price:		
1 Long Call	42	42
2 Long Put	42	42
Gross Pay Off:		
1 Long Call	6	0
2 Long Put	0	12
	6	12
Premium paid	7	7
[3 + (2 X 2)]		
<b>Net Pay off</b>	<b>(1)</b>	<b>5</b>

**(b)**

Case	Option	Party	Exercise Price	Premium	Market Price
1	Call	Buyer	<b>140</b>	20	160
2	<b>Put</b>	Seller	2,000	300	1,700
3	<b>Put</b>	Buyer	50	10	40
4	<b>Call</b>	Seller	80	10	90
5	Put	Buyer	<b>300</b>	50	250
6	<b>Call</b>	Seller	320	50	370
7	Call	Buyer	680	100	<b>780</b>
8	Call	Seller	<b>500</b>	80	580
9	Put	Buyer	1,200	<b>180</b>	1,020
10	Put	Seller	<b>2,200</b>	330	1,870

(c)

(i) Expected share price =  $120 (.05) + 140 (.2) + 160 (.5) + 180 (.1) + 190 (.15)$   
= Rs.160.5

(ii) If spot price after 4 months is Rs.160.5 and exercise price of put option is Rs.150 then value of put shall be nil.

(iii) Expected value of put is -

Expected MPS	Strike Price	Value of Call	Pi	Expected Value
120	150	30	.05	1.5
140	150	10	.20	2.0
160	150	0	.50	0
180	150	0	.10	0
190	150	0	.15	0
				<b>3.5</b>

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