EXAM MFE QUESTIONS OF THE WEEK

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Week of February 5/07

Price of XYZ stock at time 0 is 20. Annual effective interest is at rate 5%. Call and put option (European) values for various strike prices are:

Strike Price	Call Price	Put Price
15	6.46	0.75
17	5.16	1.35
19	4.06	2.16
20	3.59	2.64
21	3.17	3.17
23	2.45	4.36
25	1.89	5.70

It is assumed that XYZ stock pays no dividends.

Formulate the payoff and profit on a collar and a collared stock based on strike prices 20 and 25.

The solution can be found below.

Week of February 5/07 - Solution

The collar consists of a purchased put 20 and a written call 25. The payoff is

$$max\{20 - S_1, 0\} - max\{S_1 - 25, 0\} = \begin{cases} 20 - S_1 & \text{if } S_1 \leq 20 \\ 0 & \text{if } 20 < S_1 \leq 25 \\ 25 - S_1 & \text{if } S_1 > 25 \end{cases}.$$

The cost at time 0 for the collar is $2.64 - 1.89 = 0.75$, and the accumulated cost at time 1

is 0.79. The profit at time 1 is
$$\begin{cases} 19.21 - S_1 & \text{if } S_1 \leq 20 \\ -.79 & \text{if } 20 < S_1 \leq 25 \\ 24.21 - S_1 & \text{if } S_1 > 25 \end{cases}.$$

The payoff on a long stock is S_1 at time 1 and the profit is $S_1 - 21$.

The payoff on the collared stock is
$$\begin{cases} -1 & \text{if } S_1 \leq 20 \\ S_1 - 21 & \text{if } 20 < S_1 \leq 25 \\ 4 & \text{if } S_1 > 25 \end{cases},$$

and the profit is
$$\begin{cases} -1.79 & \text{if } S_1 \leq 20 \\ S_1 - 21.79 & \text{if } 20 < S_1 \leq 25 \\ 3.21 - S_1 & \text{if } S_1 > 25 \end{cases}.$$