EXAM FM QUESTIONS OF THE WEEK

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Week of April 30/07

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.

A floor is consists of being long in one share of the stock and purchasing a put with strike price 20. Suppose that another investor borrows $\$x$ at time 0, purchases a call with strike price 20 and invests the rest at 5%. What amount x results in the same profit at time 1 as the floor?

The solution can be found below.

Week of April 30/07 - Solution

The cost of the floor at time 0 is $20 + 2.64 = 22.64$, so 23.77 is owed at time 1.

The profit at time 1 on the floor is $\begin{cases} S_1 + (20 - S_1) - 23.77 = -3.77 & \text{if } S_1 \le 20 \\ S_1 - 23.77 & \text{if } S_1 > 20 \end{cases}$.

The price at time 0 of the call with strike 20 is 3.59, and $x - 3.59$ is invested at 5%.

The amount owing at time 1 is $1.05x$. The profit at time 1 is

$$(x - 3.59)(1.05) - 1.05x + \begin{cases} 0 & \text{if } S_1 \le 20 \\ S_1 - 20 & \text{if } S_1 > 20 \end{cases} = \begin{cases} 3.77 & \text{if } S_1 \le 20 \\ S_1 - 23.77 & \text{if } S_1 > 20 \end{cases}.$$

This is the same profit, no matter what amount x is borrowed at time 0.