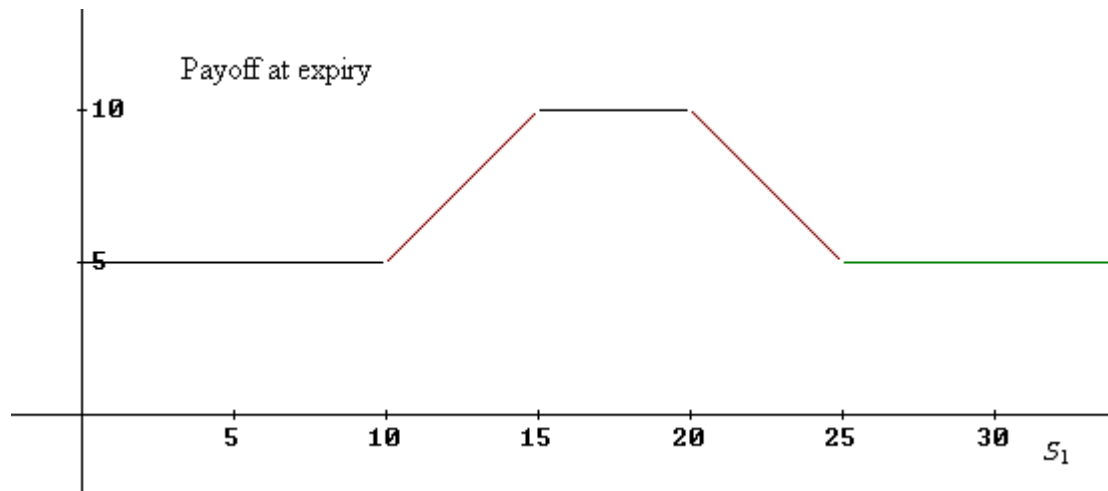


EXAM FM QUESTION OF THE WEEK

S. Broverman, 2008

Week of April 28/08

You are given the following graph for payoff at expiry (time 1) as a function of S_1 , the price of an asset at time 1. The payoff is for a European derivative security expiring at time 1,



You are also given the following prices of European options expiring at time 1.

Strike Price	Call Price	Put Price
10	7.44	.70
15	4.67	2.56
20	2.93	5.45
25	1.85	9.00

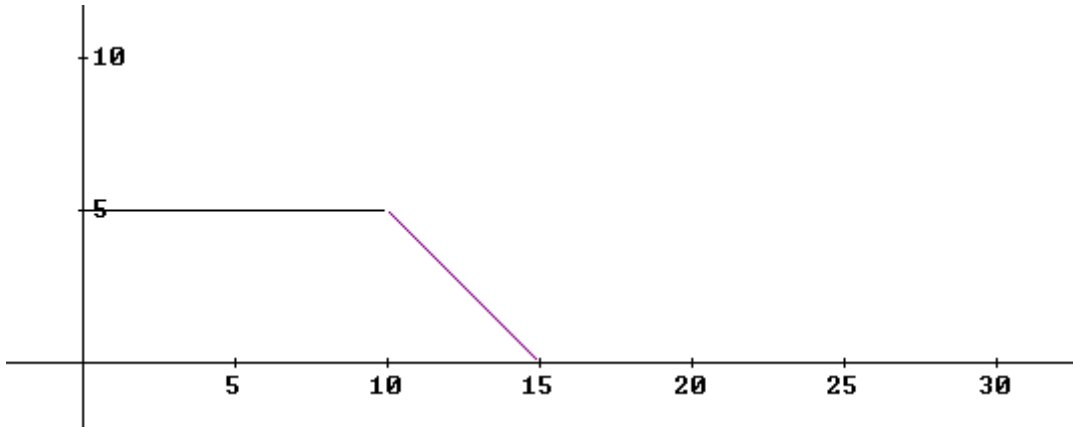
The continuously compounded risk free rate of interest is .08 .

Find the maximum possible profit at expiry. **The solution can be found below.**

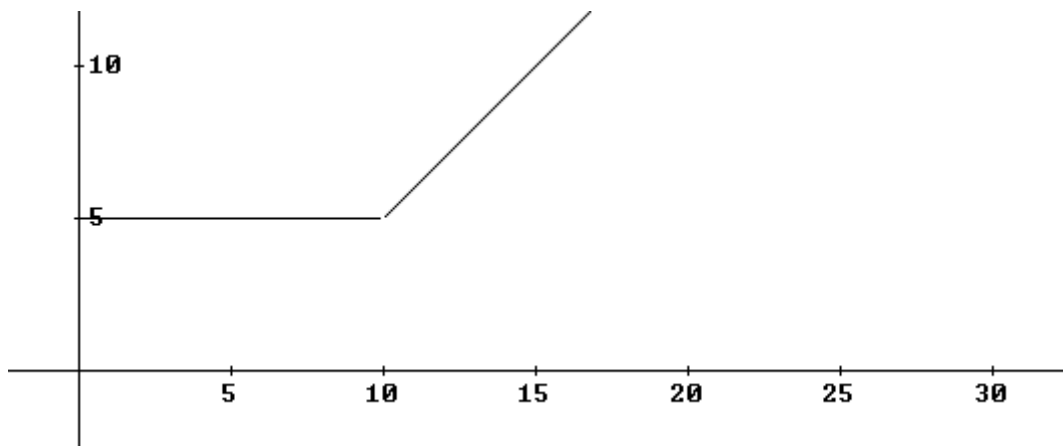
Week of April 28/08 - Solution

The payoff graph can be constructed as a combination of put and call options at differing strike prices.

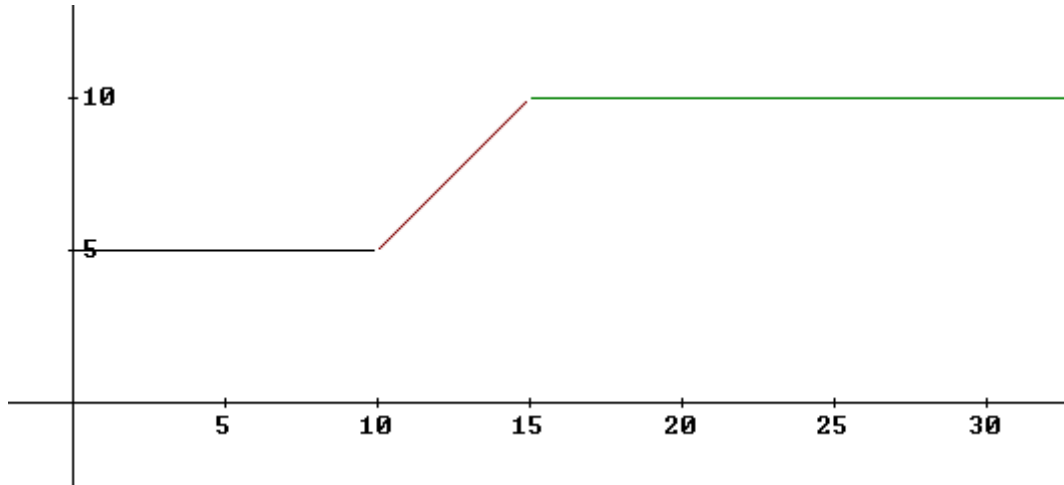
A long put with strike 15 and a short put with strike 10 results in the payoff graph



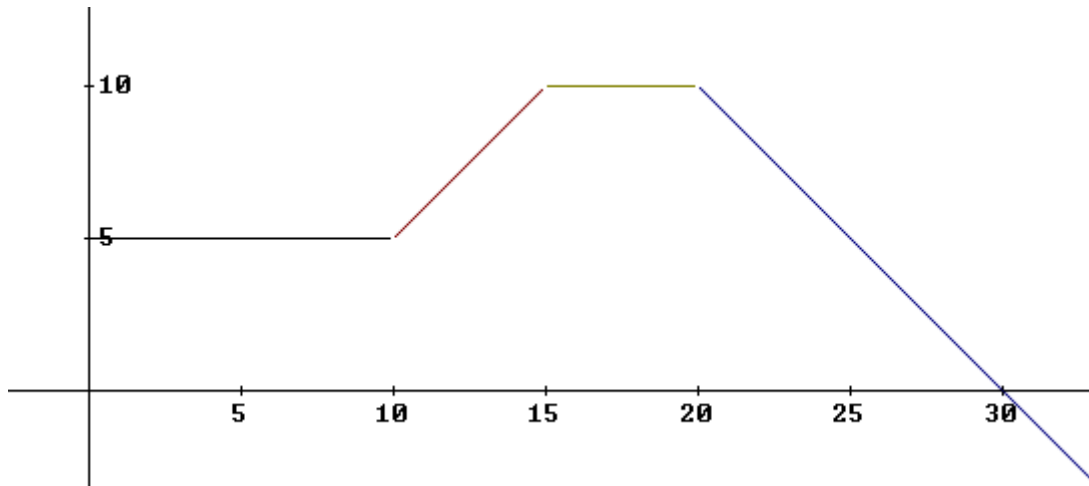
If 2 long calls with strike 10 are added, the payoff graph becomes



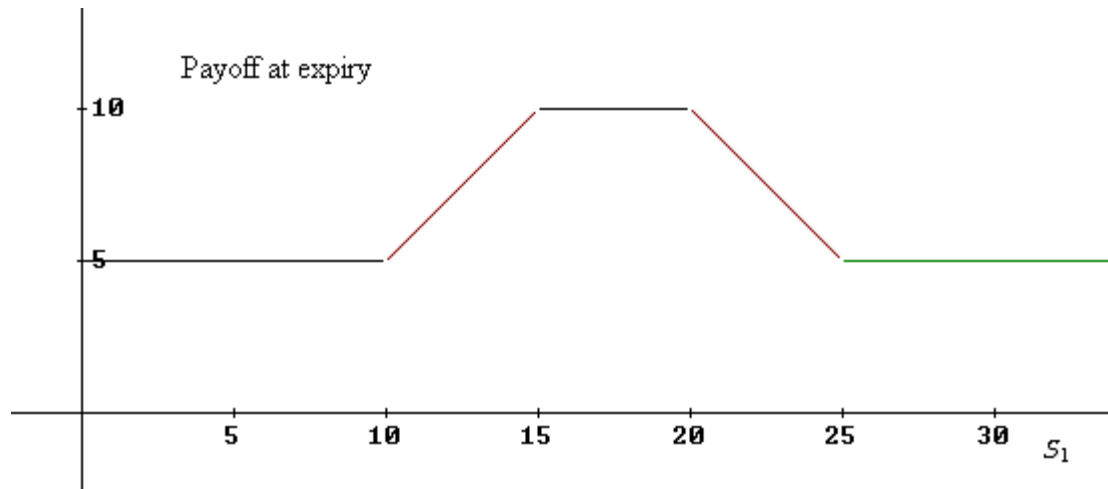
If 2 short calls with strike 15 are added, the payoff graph becomes



If a short call with strike 20 is added, the payoff graph becomes



Finally, if a long call with strike 25 is added, the payoff graph becomes



The total premium is the premium for the following combination:

- a short put with strike 10
- a long put with strike 15
- 2 long calls with strike 10
- 2 short calls with strike 15
- a short call with strike 20
- a long call with strike 25

The premium at time 0 is

$$- .70 + 2.56 + 2 \times 7.44 - 2 \times (4.67) - 2.93 + 1.85 = 6.32 .$$

The accumulated value of the premium to time 1 is $6.32e^{.08} = 6.85$.

The maximum profit occurs at the maximum payoff of 10 (which occurs if $15 \leq S_1 \leq 20$).

The maximum profit is $10 - 6.85 = 3.15$.