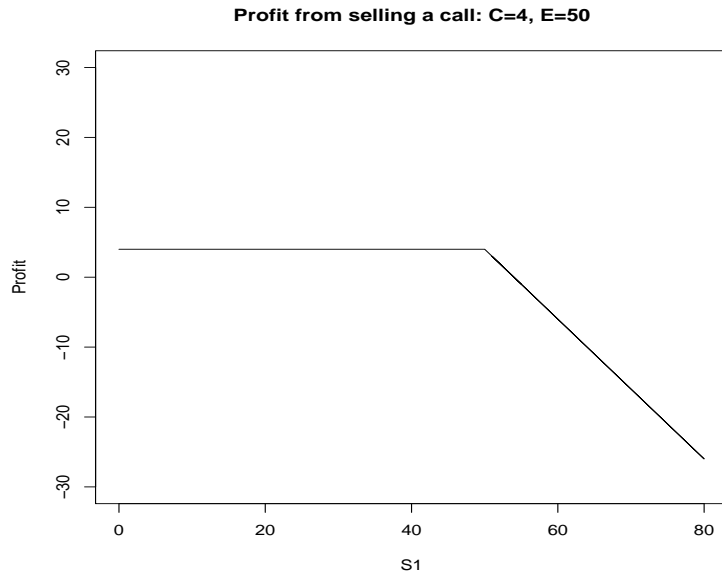**Statistics C183/C283**   **Instructor: Nicolas Christou**

Homework 4 - Solutions

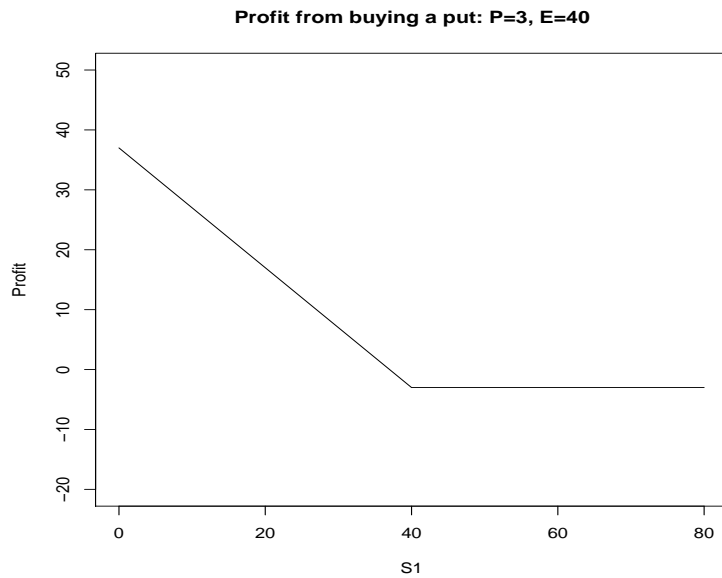**Exercise 1:**
The call option will be exercised if $S_1 > 50$. The seller of the call will make profit if $E - S_1 + C > 0$, or $50 - S_1 + 4 > 0 \Rightarrow S_1 < 54$.


Profit from selling a call: C=4, E=50

Exercise 2:
The put option will be exercised if $S_1 < 40$. The holder of the put will make profit if $E - S_1 - P > 0$ or $40 - S_1 - 3 > 0 \Rightarrow S_1 < 37$.

Profit from buying a put: P=3, E=40

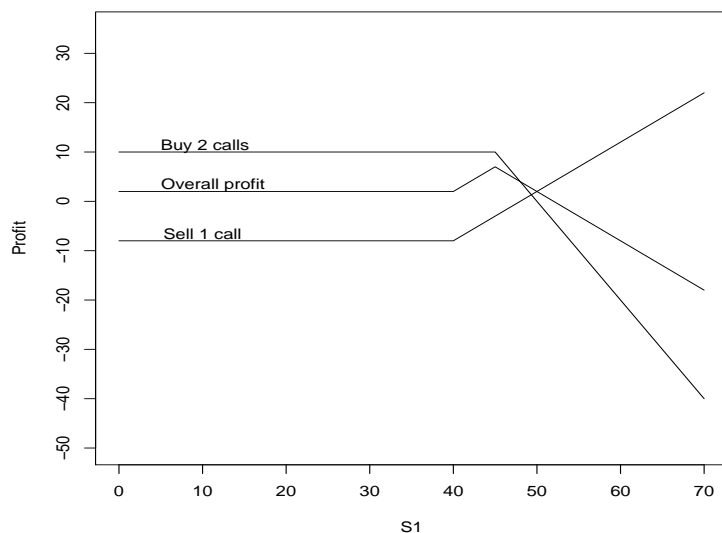**Exercise 3:**

Let S_1 be the stock price at expiration.

a. Then the 2 puts will be exercised if $S_1 < 50$. Therefore for the 2 puts the profit is: $2(50 - S_1) - 12 = 88 - 2S_1$. If $S_1 \geq 50$ then the profit is -12.

b. The call will be exercised if $S_1 > 50$. Therefore for the call the profit is: $(S_1 - 50) - 5 = S_1 - 55$. If $S_1 \leq 50$ then the profit is -5.

c. The 2 puts will be exercised if $S_1 < 50$, while the call will be exercised if $S_1 > 50$. Therefore for the 2 puts the profit is: $2(50 - S_1) - 17 = 83 - 2S_1$. For the call the profit is: $(S_1 - 50) - 17 = S_1 - 67$.
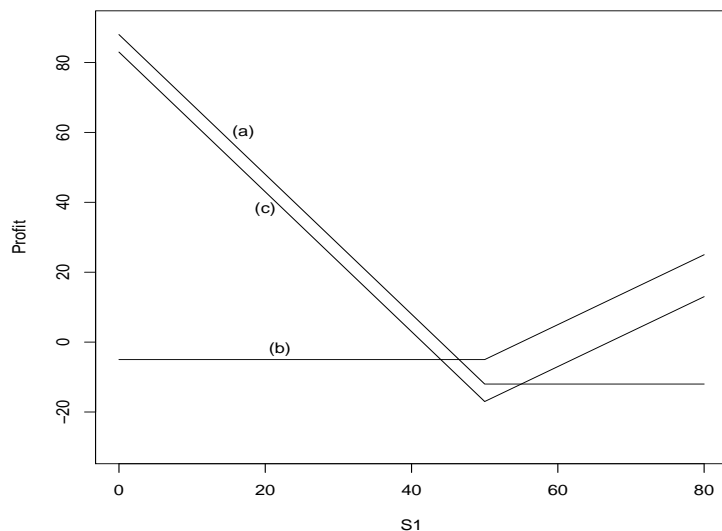
Exercise 4:

Profit from writing the two calls: If $S_1 \leq 45$ the profit is 10. If $S_1 > 50$ the profit is $10 - 2(S_1 - 45) = 100 - 2S_1$.
Profit from buying one call: If $S_1 \leq 40$ the profit is -8. If $S_1 > 40$ the profit is $S_1 - 40 - 8 = S_1 - 48$.

Exercise 5:

The table that shows the payoffs for each position:

S_T	Payoff from long call	Payoff from short call	Payoff from long put	Payoff from short put	Total
$S_T > E_2$	$S_T - E_1$	$E_2 - S_T$	0	0	$E_2 - E_1$
$E_1 < S_T < E_2$	$S_T - E_1$	0	$E_2 - S_T$	0	$E_2 - E_1$
$S_T < E_1$	0	0	$E_2 - S_T$	$S_T - E_1$	$E_2 - E_1$