

**FN 312**  
**HW 4 Solutions**

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7. a. From put-call parity:

$$P = C - S_0 + \frac{X}{(1+r_f)^T} = 10 - 100 + \frac{100}{1.10^{25}} = \$7.65$$

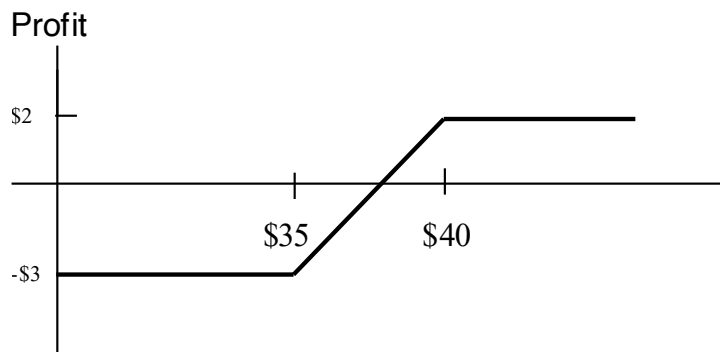
b. Purchase a straddle, i.e., both a put and a call on the stock. The total cost of the straddle is:  $\$10 + \$7.65 = \$17.65$

9. a. i. A long straddle produces gains if prices move up or down, and limited losses if prices do not move. A short straddle produces significant losses if prices move significantly up or down. A bullish spread produces limited gains if prices move up.

b. i. Long put positions gain when stock prices fall and produce very limited losses if prices instead rise. Short calls also gain when stock prices fall but create losses if prices instead rise. The other two positions will not protect the portfolio should prices fall.

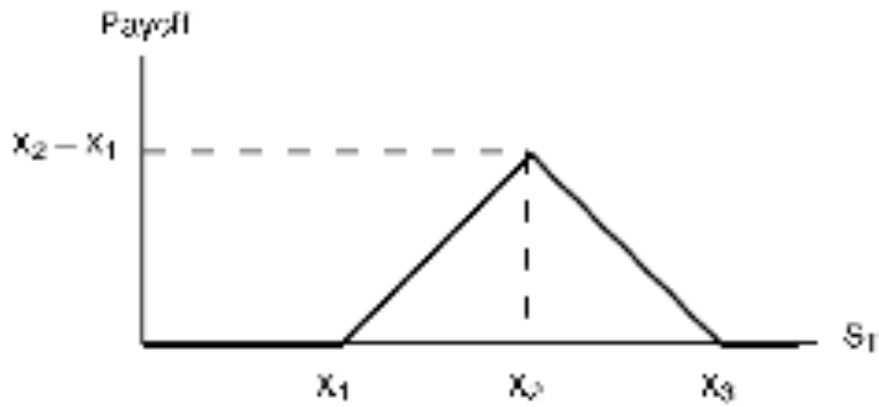
10. Note that the price of the put equals the revenue from writing the call, net initial cash outlays = \$38.00

Position	$S_T < 35$	$35 \leq S_T \leq 40$	$40 < S_T$
Buy Stock	$S_T$	$S_T$	$S_T$
Write call (\$40)	0	0	$40 - S_T$
Buy put (\$35)	$35 - S_T$	0	0
Total	\$35	$S_T$	\$40



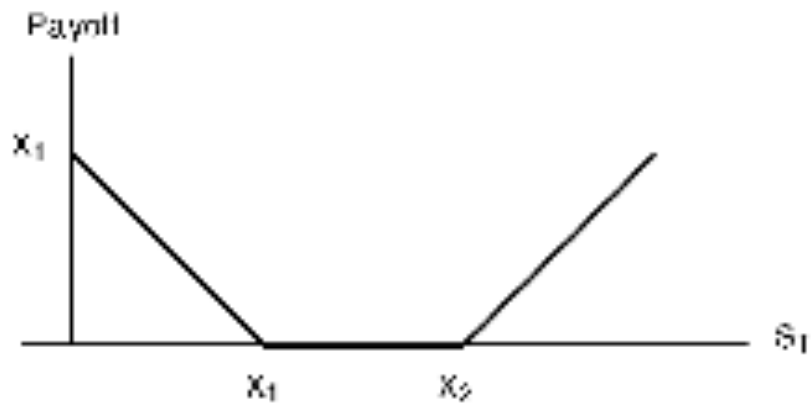
13. a.

Position	$S_T < X_1$	$X_1 \leq S_T \leq X_2$	$X_2 < S_T \leq X_3$	$X_3 < S_T$
Long call ( $X_1$ )	0	$S_T - X_1$	$S_T - X_1$	$S_T - X_1$
Short 2 calls ( $X_2$ )	0	0	$-2(S_T - X_2)$	$-2(S_T - X_2)$
Long call ( $X_3$ )	0	0	0	$S_T - X_3$
Total	0	$S_T - X_1$	$2X_2 - X_1 - S_T$	$(X_2 - X_1) - (X_3 - X_2) = 0$



b.

Position	$S_T < X_1$	$X_1 \leq S_T \leq X_2$	$X_2 < S_T$
Buy call ( $X_2$ )	0	0	$S_T - X_2$
Buy put ( $X_1$ )	$X_1 - S_T$	0	0
Total	$X_1 - S_T$	0	$S_T - X_2$

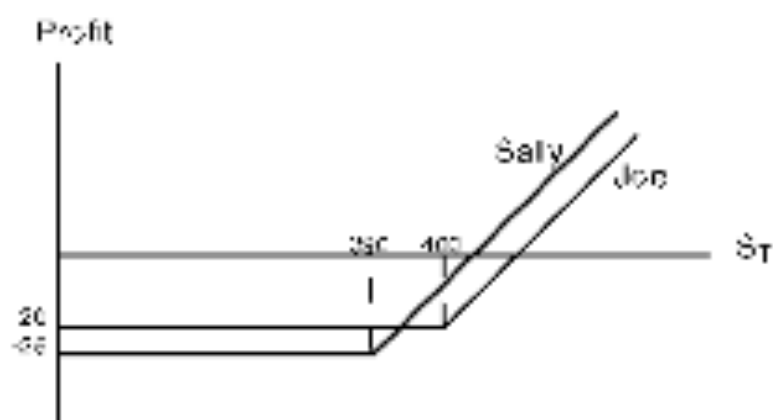


26. a. Joe's strategy

Position	Cost	Payoff	
		$S_T \leq 400$	$S_T > 400$
Stock index	400	$S_T$	$S_T$
Put option, $X = \$400$	20	$400 - S_T$	0
<b>Total</b>	<b>420</b>	<b>400</b>	<b><math>S_T</math></b>
<b>Profit = payoff - \$420</b>		<b>-20</b>	<b><math>S_T - 420</math></b>

Sally's strategy

Position	Cost	Payoff	
		$S_T \leq 390$	$S_T > 390$
Stock index	400	$S_T$	$S_T$
Put option, $X = \$390$	15	$390 - S_T$	0
<b>Total</b>	<b>415</b>	<b>390</b>	<b><math>S_T</math></b>
<b>Profit = payoff - \$415</b>		<b>-25</b>	<b><math>S_T - 415</math></b>

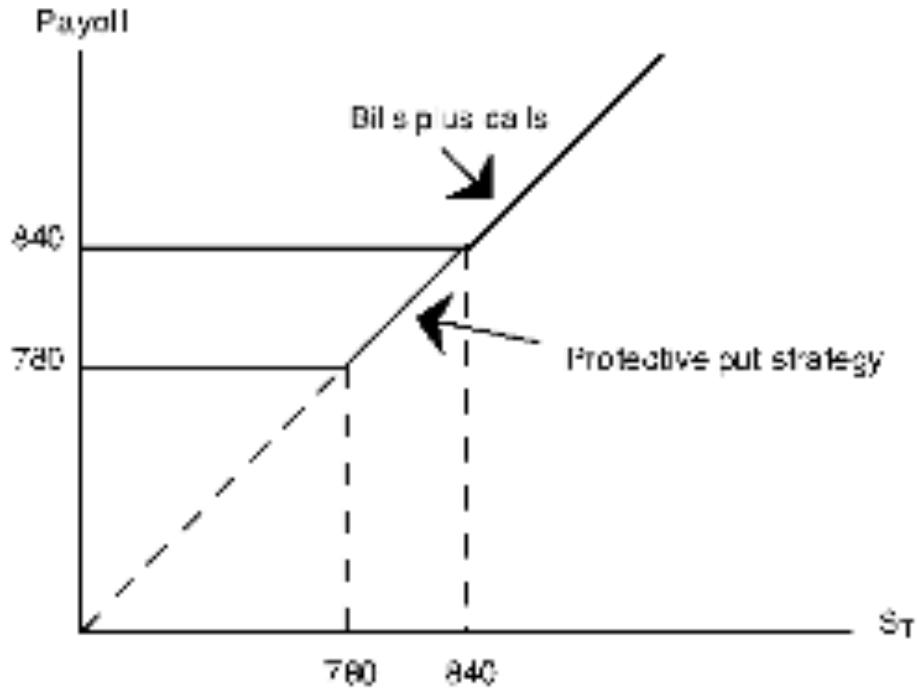


- b. Sally does better when the stock price is high, but worse when the stock price is low. The break-even point occurs at  $S_T = \$395$ , when both positions provide losses of \$20.
- c. Sally's strategy has greater systematic risk. Profits are more sensitive to the value of the stock index.

29. a.

Position	$S_T \leq 780$	$S_T > 780$
Buy stock	$S_T$	$S_T$
Buy put	$780 - S_T$	0
<b>Total</b>	<b>780</b>	<b><math>S_T</math></b>

Position	$S_T \leq 840$	$S_T > 840$
Buy call	0	$S_T - 840$
Buy T-bills	840	840
Total	840	$S_T$



b. The bills plus call strategy has a greater payoff for some values of  $S_T$  and never a lower payoff. Since its payoffs are always at least as attractive and sometimes greater, it must be more costly to purchase.

c. The initial cost of the stock plus put position is:  $\$900 + \$6 = \$906$   
 The initial cost of the bills plus call position is:  $\$810 + \$120 = \$930$

	$S_T = 700$	$S_T = 840$	$S_T = 900$	$S_T = 960$
Stock	700	840	900	960
+ Put	80	0	0	0
Payoff	780	840	900	960
Profit	-126	-66	-6	54
Bill	840	840	840	840
+ Call	0	0	60	120
Payoff	840	840	900	960
Profit	-90	-90	-30	+30