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MA 528 HW 5

11.3 $\left(15 - 12e^{.06\frac{1}{12}}\right)e^{-.06\frac{1}{12}} = \boxed{\$2.93}$

forward price of stock

11.4
Reason 1: The longer you wait to call, the more time that money has to grow at a risk free rate. Money is more valuable now.

Reason 2: Strike price could end up being higher than the spot price at the expiration date. Delaying the exercise of the option ensures that you make $\text{Max}(S_T - K, 0)$ at expiration and are guarenteed not to lose money from the exercise of the option (not including the cost of the option).

11.11 Current Value of Strike Price (w/ $r = .12$) is $\$60 e^{-.12\frac{1}{3}} = \$57.65$

Stock Price is \$64, Dividend worth $\$.8e^{-.12\frac{1}{12}} = \$.79$

Arbitrageur can short sell n stocks for \$64n. \$.79n will be invested to pay off the dividend in a month. n options will be bought for \$5n. The remaing \$58.21n will be invested at $r = .12$.

Case 1: $S_T \leq 60$
Purchase n stock at expiration and close short position.

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Case 2: $S_T > 60$
Exercise n options and close short position.

Profits (Present Value)

Case 1:
$58.21n - S_T e^{-.12\frac{1}{3}} n$

$\boxed{\text{Profit} \geq \$.56n}$

n is the number of options bought

Case 2:
$58.21n - 60e^{-.12\frac{1}{3}} n$

$\boxed{\text{Profit} = \$.56n}$

11.14 Profit from Put Option:
$\text{Max}(30 - S_T, 0)\, e^{-.1\frac{1}{2}} - p$

Put - Call Parity $\mapsto$ Profit from Put = Profit from Call when $S_T = S_0 e^{rT}$

Profit from Call Option:
$\text{Max}(S_T - 30, 0)\, e^{-.1\frac{1}{2}} - c + .5(e^{-.1\frac{1}{6}} + e^{-.1\frac{5}{12}})$

Thus, as $S_0 = 29$ and $30e^{-.1\frac{1}{2}} = 28.54$

We gen $-p = .46 - 2 - .5(e^{-.1\frac{1}{6}} + e^{-.1\frac{5}{12}})$

$p = .5(e^{-.1\frac{1}{6}} + e^{-.1\frac{5}{12}}) + 1.54$

$\boxed{p = \$2.51}$

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11.19 As per EQN 11.7:

$$S_0 - K' \le C - P \le S_0 - K'e^{-rt}$$

if there are no dividends

If dividends are introduced, then this is equivalent to the strike price decreasing by D (see Business Snapshot 10.1)

Thus, $K = K' - D \rightsquigarrow K' = K + D$

$S_0 - K' \le C - P$ becomes $S_0 - D - K \le C - P$

$C - P \le S_0 - K'e^{-rT}$ becomes $C - P \le S_0 - Ke^{-rT} - De^{-rT}$

Since $-De^{-rT} \le 0$, $C - P \le S_0 - Ke^{-rT}$ as well

$$\boxed{\text{Therefore, } S_0 - D - k \le C - P \le S_0 - Ke^{-rT}}$$

12.3 A butterfly spread should be utilized when the investor thinks that the stock price will remain close to a price P. The butterfly spread will consist of buying options at strike prices K_1, K_2, and K_3, with K_2 set to P. Of course, $K_1 < K_2 < K_3$.

12.6 Strangles and Straddles both have a long position in a call and a long position in a put. In a strangle, the strike prices are different but the expiration dates are the same. In a straddle, the strike prices and the expiration dates are the same.

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12.8 Put-Call Parity: $p_i + S_0 = c_i + K_i e^{-rT}$ for $i=1,2$

Bull Spread using calls costs $c_1 - c_2$
Bull Spread using puts costs $p_1 - p_2$

$$p_1 - p_2 = c_1 - c_2 - (K_1 - K_2)e^{-rT}$$

$\boxed{\text{The Bull Spread using puts costs } (K_1-K_2)e^{-rT} \text{ less than the Bull Spread using calls}}$

12.12 Profit Table

	$S_T \geq 60$	$S_T < 60$
Call	$S_T - 60 - 6$	-6
Put	-4	$60 - S_T - 4$
Σ	$S_T - 70$	$50 - S_T$

$\boxed{\text{For } \$50 \leq S_T \leq \$70 \text{, the straddle would result in a loss.}}$

12.13 Payoff Table

	$S_T < K_1$	$K_1 \leq S_T \leq K_2$	$K_2 < S_T$
Long K_1 put	$K_1 - S_T$	0	0
Short K_2 put	$S_T - K_2$	$S_T - K_2$	0
Σ	$-(K_2 - K_1)$	$-(K_2 - S_T)$	0