SOLUTION HOMEWORK 5
CHAPTER 21: OPTION VALUATION

PROBLEM SETS

9. a. $uS_0 = 130 \Rightarrow P_u = 0$

$dS_0 = 80 \Rightarrow P_d = 30$

The hedge ratio is: $H = \frac{P_u - P_d}{uS_0 - dS_0} = \frac{0 - 30}{130 - 80} = -\frac{3}{5}$

b.

Riskless Portfolio	$S_T = 80$	$S_T = 130$
Buy 3 shares	240	390
Buy 5 puts	150	0
Total	390	390

Present value = \$390/1.10 = \$354.545

c. The portfolio cost is: 3S + 5P = 300 + 5P

The value of the portfolio is: \$354.545

Therefore: 300 + 5P = \$354.545 → P = \$54.545/5 = \$10.91

10. The hedge ratio for the call is: $H = \frac{C_u - C_d}{uS_0 - dS_0} = \frac{20 - 0}{130 - 80} = \frac{2}{5}$

Riskless Portfolio	S = 80	S = 130
Buy 2 shares	160	260
Write 5 calls	0	-100
Total	160	160

Present value = \$160/1.10 = \$145.455

The portfolio cost is: 2S – 5C = \$200 – 5C

The value of the portfolio is: \$145.455

Therefore: C = \$54.545/5 = \$10.91

Does P = C + PV(X) – S?

10.91 = 10.91 + 110/1.10 – 100 = 10.91

11. $d_1 = 0.2192 \Rightarrow N(d_1) = 0.5868$

$d_2 = -0.1344 \Rightarrow N(d_2) = 0.4465$

$Xe^{-rT} = 49.2556$

C = \$50 × 0.5868 – 49.2556 × 0.4465 = \$7.34

18. The best estimate for the change in price of the option is:

Change in asset price × delta = −$6 × (-0.65) = $3.90

23. Implied volatility has increased. If not, the call price would have fallen as a result of the decrease in stock price.

24. Implied volatility has increased. If not, the put price would have fallen as a result of the decreased time to expiration.

CHAPTER 22: FUTURES MARKETS

PROBLEM SETS

8. a. $F_0 = S_0(1 + r_f) = \$150 \times 1.03 = \$154.50$

   b. $F_0 = S_0(1 + r_f)^3 = \$150 \times 1.03^3 = \$163.91$

   c. $F_0 = 150 \times 1.06^3 = \$178.65$

11. The put-call parity relation states that: But spot-futures parity tells us that:

$$C = P + S_0 - \frac{X}{(1 + r_f)^T} \qquad F = S_0 \times (1 + r_f)^T$$

Substituting, we find that:

$$P = C - S_0 + \frac{[S_0 \times (1 + r_f)^T]}{(1 + r_f)^T} = C - S_0 + S_0 = C$$

16. The parity value of F is: 1,300 × (1 + 0.04 – 0.01) = 1,339

The actual futures price is 1,330, too low by 9.

Arbitrage Portfolio	CF now	CF in 1 year
Short Index	1,300	$-S_T - (0.01 \times 1{,}300)$
Buy Futures	0	$S_T - 1{,}330$
Lend	−1,300	1,300 × 1.04
Total	0	9

18. a. The current yield for Treasury bonds (coupon divided by price) plays the role of the dividend yield.

b. When the yield curve is upward sloping, the current yield exceeds the short rate. Hence, T-bond futures prices on more distant contracts are lower than those on near-term contracts.