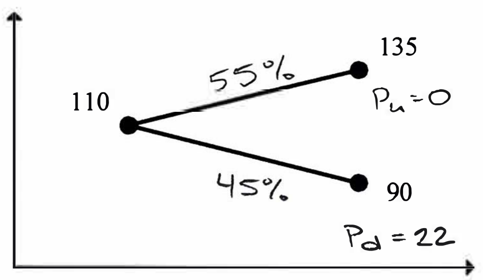
HW 10.1 (b) Key

1. Prices for a nondividend-paying stock are modeled by the 1-period binomial tree shown below, with the period being 6 months and the probability of an up move being $p = 55\%$. A 112-strike, 6-month European call on this stock has a premium of 11.25. The risk-free rate of interest is $r = 4.5\%$. Find the continuously compounded expected annual yield of a 112-strike, 6-month European put. [20a_06]



$t = 1/2 \qquad K = 112 \qquad r = 4.5\%$

$11.25 - Put = 110 - 112\,e^{-0.0225}$

$Put = 10.76$

$E[PO] = 0.45(22) = 9.9$

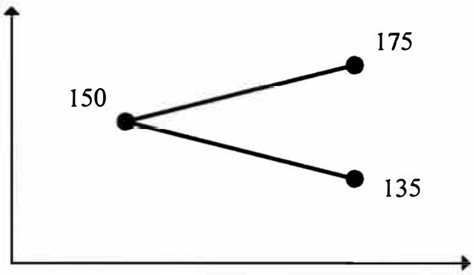
−16.60%

$\boxed{\text{A)}}$ ~~−16.47%~~ B) −16.80% C) −17.13% D) −17.46% E) −17.79%

$10.76\,e^{\gamma/2} = 9.9$

$\boxed{\hat{\gamma} = -16.60\%}$

2. Prices for a nondividend-paying stock are modeled by the 1-period binomial tree shown below, with the period being 6 months. The expected price of the stock in 6 months is 154.60. Find the probability of an up move, *p*. [20a_07]



$t = 1/2$

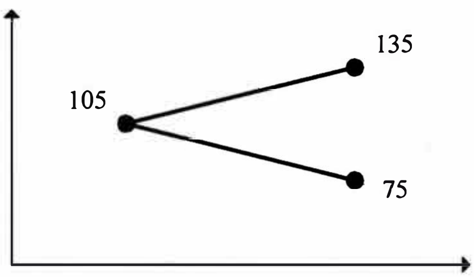
$175p + 135(1-p) = 154.60$

$40p + 135 = 154.60$

$\boxed{p = 49\%}$

$\boxed{\text{A)}}$ 49% B) 48% C) 50% D) 51% E) 52%

3. Prices for a nondividend-paying stock are modeled by the 1-period binomial tree shown below, with the period being 6 months. The continuously compounded expected annual yield of the stock is $\alpha = 13.26\%$. Find the probability of an up move, *p*. [20a_08]



$t = 1/2$

$E[S_{1/2}] = 105e^{0.1326/2} = 112.20$

$135p + 75(1-p) = 112.20$

$60p + 75 = 112.20$

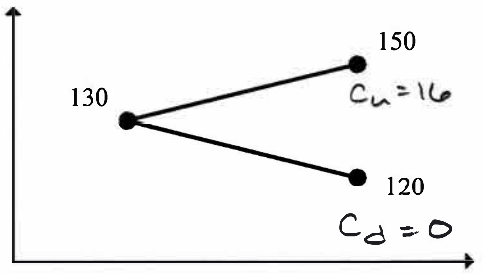
$\boxed{p = 62\%}$

$\boxed{\text{A)}}$ 62% B) 59% C) 60% D) 61% E) 63%

4. Prices for a nondividend-paying stock are modeled by the 1-period binomial tree shown below, with the period being 4 months. A 134-strike, 4-month European call on this stock has a premium of 6.39. The continuously compounded expected annual yield of the [redacted] is $\gamma = 22.17\%$. Find the probability of an up move, p. [20a_09]

call

$t = 1/3 \qquad K = 134$



$E[PO] = 6.39\, e^{0.2217/3} = 6.88$

$16p = 6.88$

$\boxed{p = 43\%}$

$\boxed{\text{A)}}$ 43% B) 40% C) 41% D) 42% E) 44%

5. The current price of a nondividend paying stock is 160. Prices for the stock are modeled by a 1-period binomial tree, with a period of 8 months. The expected value of the stock after 8 months is 167.95. The expected payoff of a 8-month European call with a strike price of 156 is 20.01. The difference between the price of the stock at the upper node and the price at the lower node is 55. Find the probability of an up move, p. [20a_10]
$\boxed{\text{A)}}$ 69% B) 68% C) 70% D) 71% E) 72%

① $p \cdot S_u + (1-p)\, S_d = 167.95$

② $p(S_u - 156) = 20.01 \longrightarrow S_u = \dfrac{20.01}{p} + 156$

③ $S_u - S_d = 55$

① & ③: $pS_u + (1-p)(S_u - 55) = 167.95$

$S_u - 55 + 55p = 167.95$

$\dfrac{20.01}{p} + 156 - 55 + 55p = 167.95$

$55p^2 - 66.95p + 20.01 = 0$

$\boxed{p = 0.69}$ or $p = 0.5273$ ← It is possible for there to be two valid solns to this problem.