Part IV   Risk Management Products

OPTIONS

1. **Answer is (d)**

2. We simply remember that the expected drift of the stock in a simple Black-Scholes model, with a continuous dividend yield, is given by

$$\text{INTEREST RATE} - \text{DIVIDEND YIELD} - \frac{(\text{VOLATILITY})^2}{2}$$

In this case over one year we have

$$(0.06) - (0.02) - \frac{(0.20)^2}{2} \quad = \quad 0.02$$

Hence the stock price is expected to drift up at 2% per annum.

Answer is (b)

3. Remember the probability of exercise in the Black-Scholes model for a put option is $N(-d_2)$

$$d_2 = \frac{LN\left(S/X\right) + \left[(r-d) - \sigma^2/2\right]T}{\sigma\sqrt{T}}$$

$$= \frac{LN\left(100/100\right) + \left[(0.05-0.02) - \frac{(0.20)^2}{2}\right]0.25}{0.20\sqrt{0.25}}$$

$$= 0.025$$

N(-0.025) is, from the normal distribution tables provided, 0.4900. Hence there is a 49% chance that this option will be exercised.

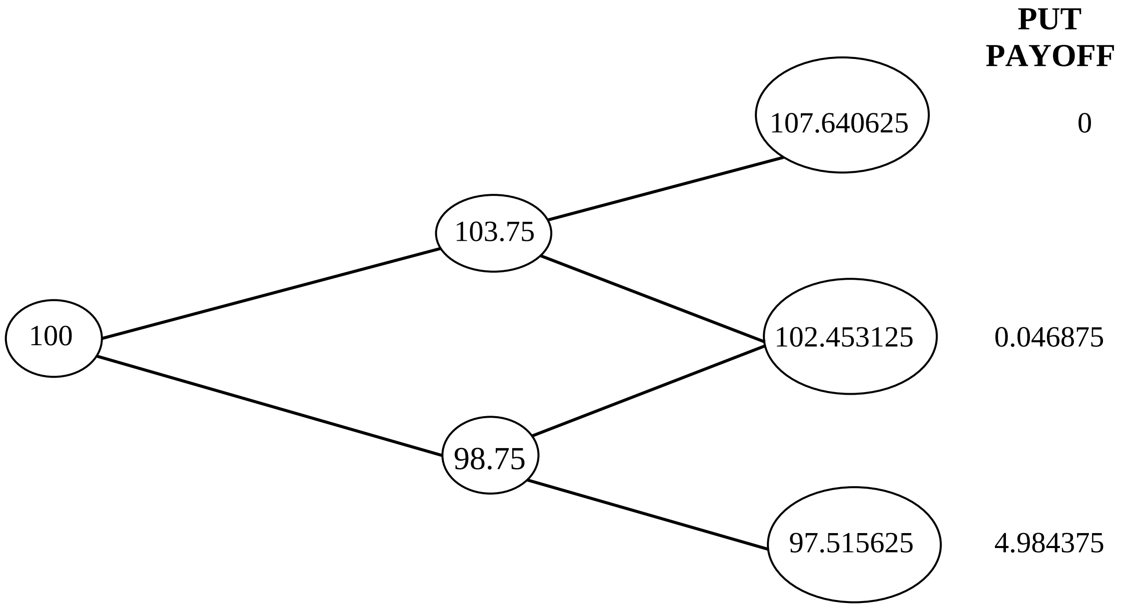
Answer is (b)

4. The first thing we need to do is work out the probability of an up step and a down step.

$$P\,(103.75) + (1-P)\,(98.75) = 100(1.0125)$$

$$P = 0.50 \qquad (1-P) = 0.50$$

We can construct the price tree:



Now we value the put in period 1 on the up step and the down step.

UPSTEP $$P = \frac{0.50(0.046875) + .050(0)}{1.0125} = 0.02315$$

DOWNSTEP $$P = \frac{0.50(4.984375) + 0.50(0.046875)}{1.0125} = 2.48457$$

Note that 2.48457 is well below the intrinsic value along the down step of (102.50 – 98.75) or 3.75. Hence we substitute this value to find the option price at period 0.

$$P = \frac{0.50(0.02315) + 0.50(3.75)}{1.0125} = 1.86328$$

Since this is less than the intrinsic value at period 0 of 2.50, the value of the option is 2.50.

Answer is (d)

5. This is a simple application of put-call parity

$$C - P = \frac{F - K}{1 + RT}$$

or $C - P = \dfrac{S - K}{1 + RT}$

so $P = C - S + \dfrac{K}{1 + RT}$

$$= 2 - 100 + \frac{105}{1.0125} = \underline{\underline{5.7037}}$$

Answer is (c)