EUROPEAN PUT:

$S_0 = 30$, $E = 29$, $r = 5\%$ PER YEAR

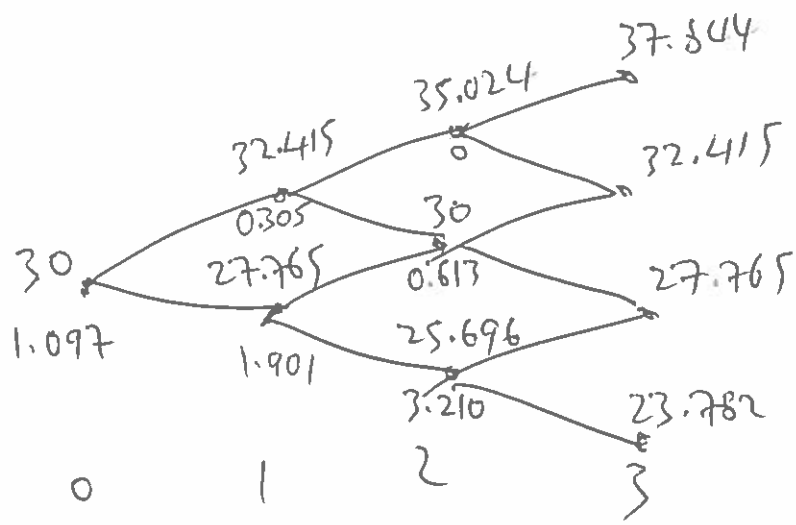
$\sigma = 0.30$ $t = 73$ DAYS $\left(\frac{1}{5} \text{ OF A YEAR}\right)$

$n = 3$ $r_p = 1.05^{1/5} - 1 = 0.009758$

COMPUTE: $U = 1.0805$, $d = 0.9255$

$$p = \frac{1 + r_p - d}{U - d} = 0.5015; \quad 1 - p = 0.4985$$

BINOMIAL TREE:



PAYOFF

0

0

1.235

5.218

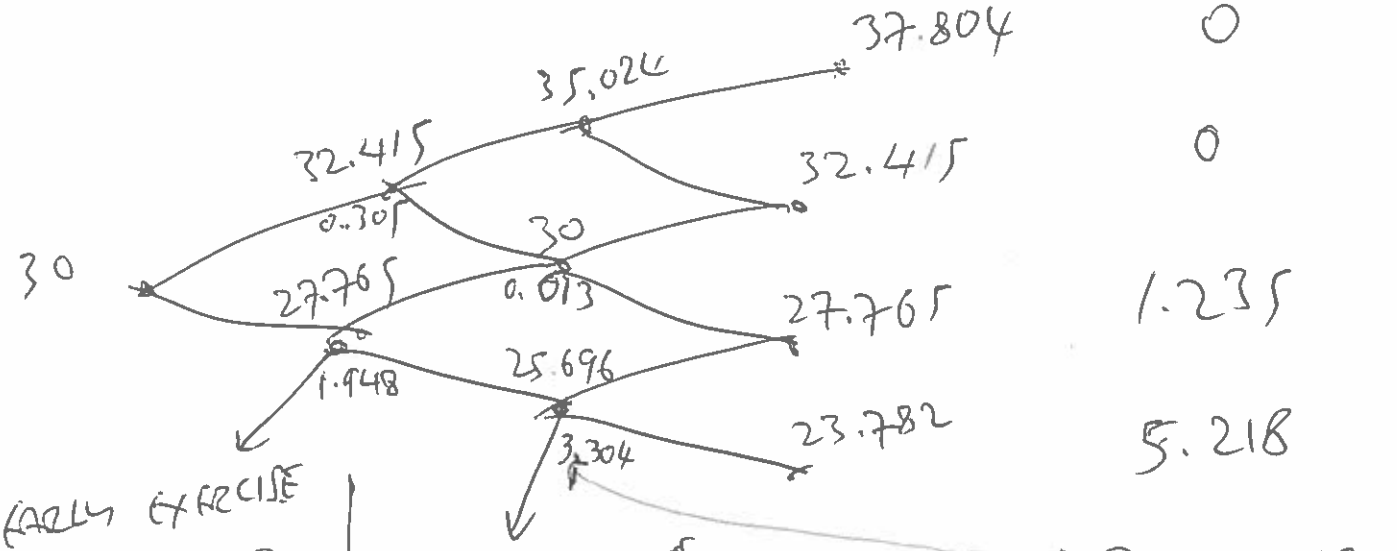
$$P = \frac{3 \times 1.235\, p(1-p)^2 + 5.218\,(1-p)^3}{(1 + r_p)^3} = 1.097$$

(OR ALSO WE CAN FIND THE PRICE OF THE EUROPEAN PUT USING PUT-CALL PARITY $C + \frac{E}{(1+r_p)^n} = P + S_0$)

AMERICAN PUT: (SAME DATA)

THE VALUE OF THE PUT OPTION AT EACH NODE IS THE GREATER BETWEEN

1. THE VALUE GIVEN BY THE PRESENT VALUE OF THE EXPECTED PAYOFF OF THE TWO NODES AFTER THE NODE IN CONSIDERATION
2. THE PAYOFF FROM EARLY EXERCISE



EARLY EXERCISE

$E-S = 1.235$

PUT

$\dfrac{1.948\,p + 3.304\,(1-p)}{1+r_p} = 1.948$ ← LARGER

POSSIBILITY OF EARLY EXERCISE: $E-S = 3.304$ → LARGER

COMPARE IT TO:

$\dfrac{1.235\,p + 5.218\,(1-p)}{1+r_p} = 3.210$

FINALLY, $p = \dfrac{0.305\,p + 1.948\,(1-p)}{1+r_p} = 1.120$