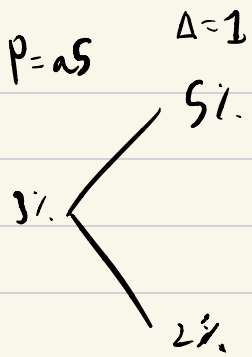
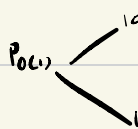


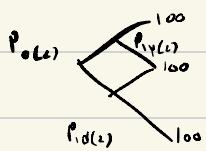
① price of 1-year ZCB



$P_{0(1)} = 100 \times e^{-r_0 \times \Delta} = 100 \times e^{-3\% \times 1}$

decision tree

② price of 2-yr zcb at year 1?



$P_{1u}(2) = 100 \times e^{-r_{1,u} \times 1} = 100 \times e^{-5\% \times 1}$

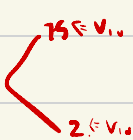
$P_{1d}(2) = 100 \times e^{-r_{1,d} \times 1} = 100 \times e^{-2\% \times 1}$

More info: $Z(0,2) = 0.95 \rightarrow P_0(2) = 100 \times Z(0,2) = 100 \times 0.95 = \$95$

How? $\Lambda_0 = \dfrac{e^{-r_0 \times \Delta} \times [0.5 \times P_{1u}(2) + 0.5 \times P_{1d}(2)] - P_0(2)}{P_{1u}(2) - P_{1d}(2)}$

$p^* = \dfrac{e^{r_0 \times \Delta} \times P_0(2) - P_{1d}(2)}{P_{1u}(2) - P_{1d}(2)}$

Price Something:



Method 1: use Λ_0

$\Lambda_0 = \dfrac{e^{-r_0 \times \Delta} \times [0.5 \times V_{1u} + 0.5 \times V_{1d}] - V_0}{V_{1u} - V_{1d}}$

$V_0 = e^{-r_0 \times d} \times [0.5 \times V_{1u} + 0.5 \times V_{1d}] - \Lambda_0 [V_{1u} - V_{1d}]$ (from previous question)

Method: use p^*

$V_0 = e^{-r_0 \times \Delta} \times [p^* \times V_{1u} + (1-p) \times V_{1d}$