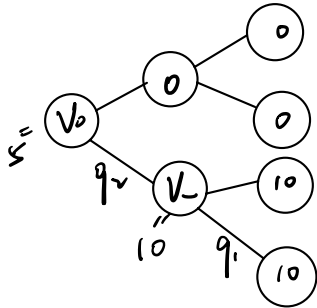


1.  $r=0$   $K=55$  digital put option



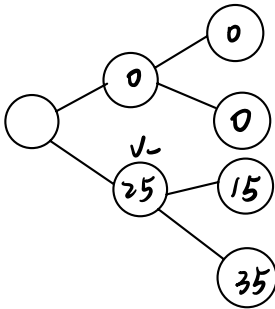
$$q_1 = \frac{40-30}{40-20} = \frac{1}{2}$$

$$V_- = \frac{1}{2} \times 10 + \frac{1}{2} \times 10 = 10$$

$$q_2 = \frac{70-50}{70-30} = \frac{1}{2}$$

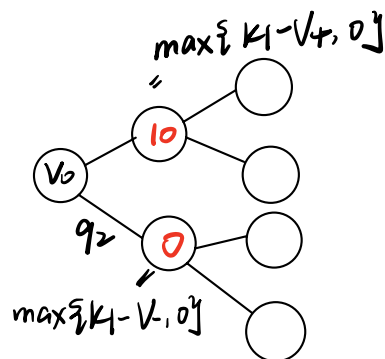
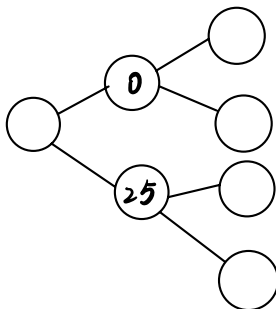
$$V_0 = \frac{1}{2} \times 0 + \frac{1}{2} \times 10 = 5$$

2.  $r=0$  put-on-put  $K_1=10$   $K_2=55$



$$V_- = \frac{1}{2} \times (15+35) = 25$$

consider  $K_1=10$ .

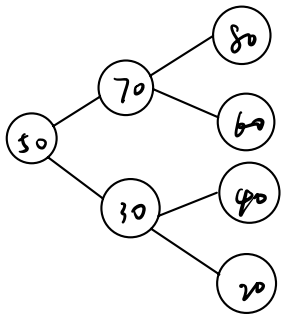


$$q_2 = \frac{70-50}{70-30} = \frac{1}{2}$$

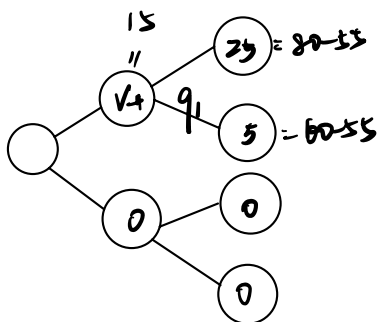
$$V_0 = \frac{1}{2} \times 10 + \frac{1}{2} \times 0 = 5$$

3.  $r=0$  chooser option  $\max\{C(S_T, T_1, T_2, k_1) - k_3, P(S_T, T_1, T_2, k_2) - k_4, 0\}$

$$k_1=55 \quad k_2=50 \quad k_3=5 \quad k_4=5$$



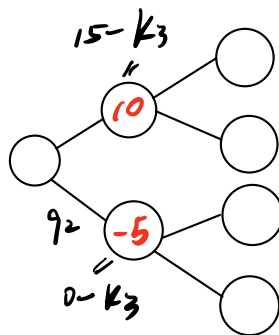
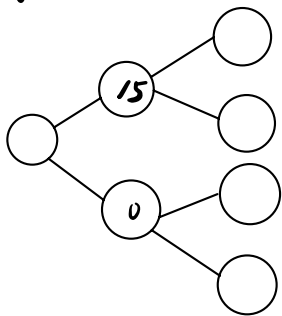
consider call-on-call option with  $k_1=55, k_3=5$



$$q_1 = \frac{80-70}{80-60} = \frac{1}{2}$$

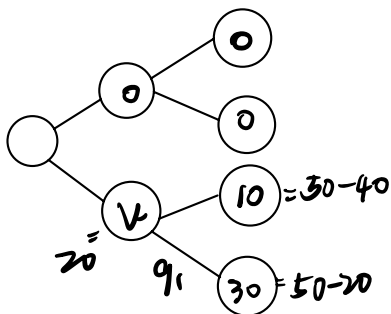
$$V_1 = \frac{1}{2} \times 25 + \frac{1}{2} \times 5 = 15$$

for  $k_3=5$



$$q_2 = \frac{70-50}{70-30} = \frac{1}{2}$$

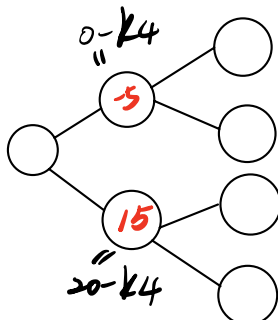
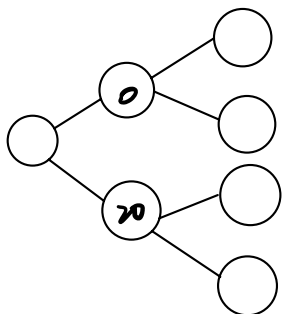
consider call-on-put option with  $k_2=50, k_4=5$



$$q_1 = \frac{40-30}{40-20} = \frac{1}{2}$$

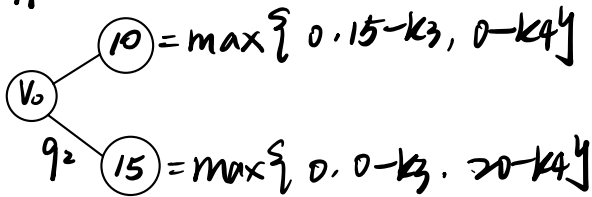
$$V_1 = \frac{1}{2} \times 10 + \frac{1}{2} \times 30 = 20$$

for  $k_4=5$



$$q_2 = \frac{70-50}{70-30} = \frac{1}{2}$$

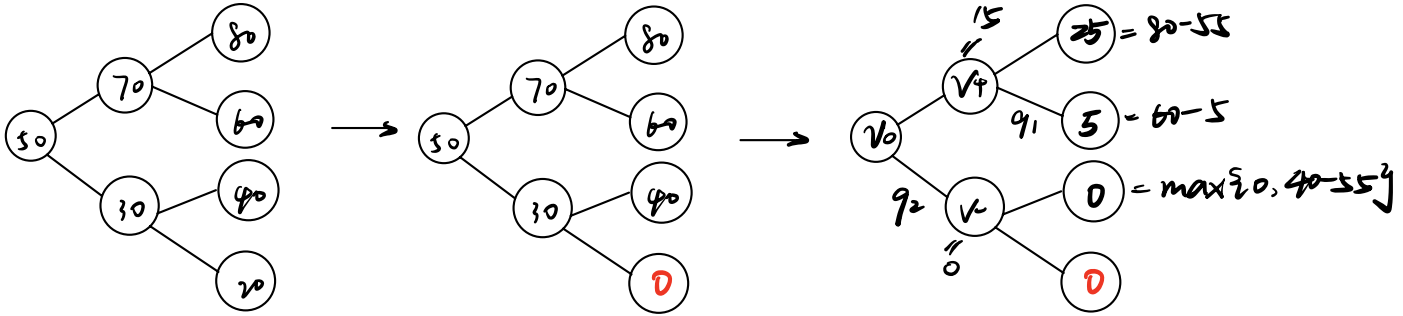
$T_1$



$$V_0 = \frac{1}{2} \times 15 + \frac{1}{2} \times 10 = 12.5$$

4.  $r=0$  down-and-out call barrier  $k=55$   $B=35$ .

价格降到35后期权无价值

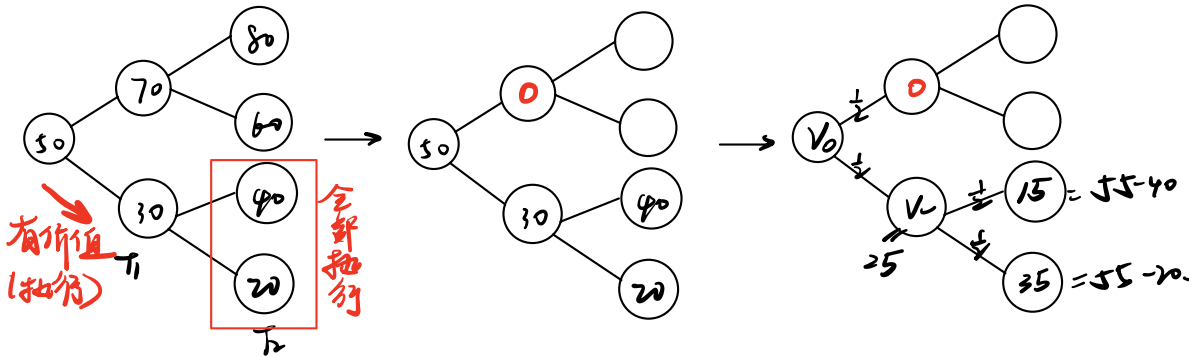


$$q_1 = \frac{80-70}{80-60} = \frac{1}{2} \quad q_2 = \frac{70-50}{70-30} = \frac{1}{2}$$

$$V_+ = \frac{1}{2} \times 15 + \frac{1}{2} \times 5 = 15 \quad V_- = 0 \quad V_0 = \frac{1}{2} \times 15 + \frac{1}{2} \times 0 = 7.5$$

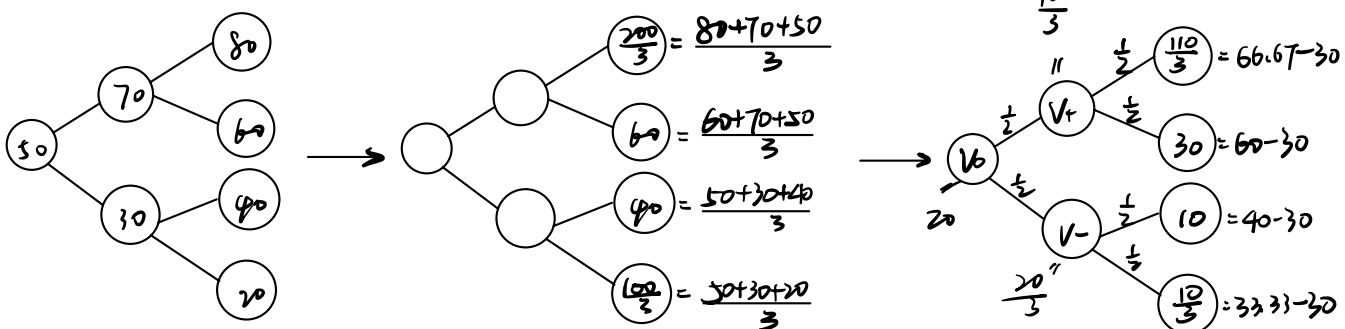
5.  $r=0$  down-and-in put barrier  $k=55$   $B=35$

价格降到35之后期权才有价值



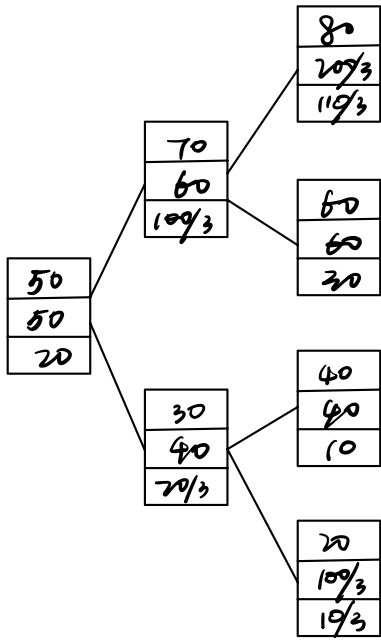
$$V_- = \frac{1}{2} \times (15 + 35) = 25 \quad V_0 = \frac{1}{2} \times 25 + \frac{1}{2} \times 0 = 12.5$$

6.  $r=0$   $S=0$  Asian average call  $k=30$ .

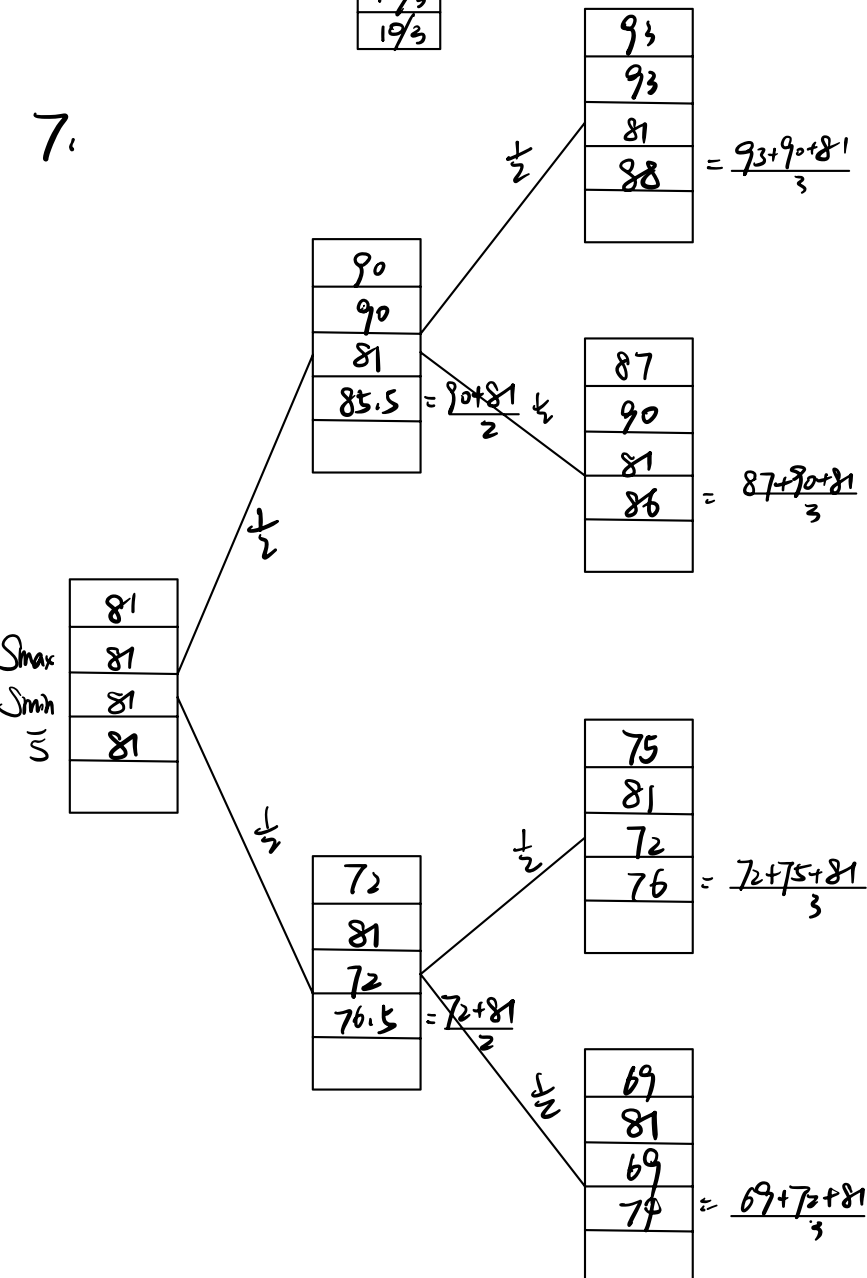


$$V_+ = \frac{1}{2} \times \frac{200}{3} + \frac{1}{2} \times 30 = \frac{100}{3} \quad V_- = \frac{1}{2} \times 10 + \frac{1}{2} \times \frac{10}{3} = \frac{20}{3}$$

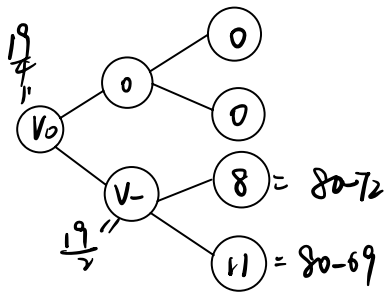
$$V_0 = \frac{1}{2} \times \frac{100}{3} + \frac{1}{2} \times \frac{20}{3} = 20.$$



7.



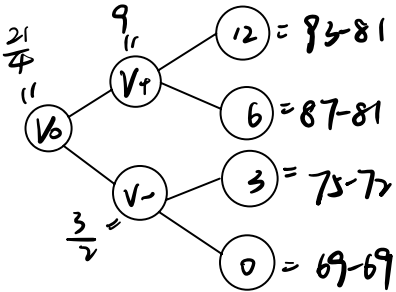
1)  $\max \{0, S - \min\}$



$$V_+ = \frac{1}{2} \times 8 + \frac{1}{2} \times 11 = \frac{19}{2}$$

$$V_0 = \frac{1}{2} \times 0 + \frac{1}{2} \times \frac{19}{2} = \frac{19}{4}$$

2)  $\max \{0, S - \min\}$

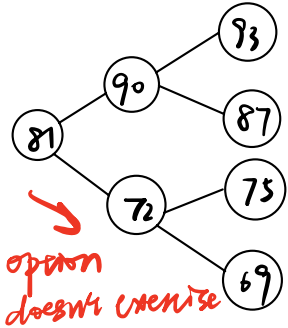


$$V_+ = \frac{1}{2} \times 12 + \frac{1}{2} \times 6 = 9$$

$$V_- = \frac{1}{2} \times 3 + \frac{1}{2} \times 0 = \frac{3}{2}$$

$$V_0 = \frac{1}{2} \times 9 + \frac{1}{2} \times \frac{3}{2} = \frac{21}{4}$$

3) down-and-out call  $B=85$   $K=69$



$$V_0 = 0.$$