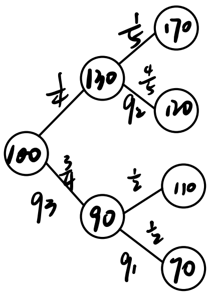
1. (a) $q = \dfrac{S_+ - S_0 e^{(r-\delta)t}}{S_+ - S_-}$ $\quad r=0 \ \delta=0$

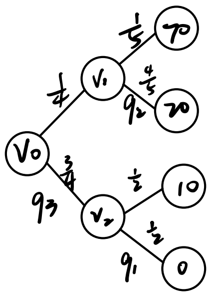


$q_1 = \dfrac{110-90}{110-70} = \dfrac{1}{2}$

$q_2 = \dfrac{170-130}{170-120} = \dfrac{4}{5}$

$q_3 = \dfrac{130-100}{130-90} = \dfrac{3}{4}$

(b) call option $K=100$.

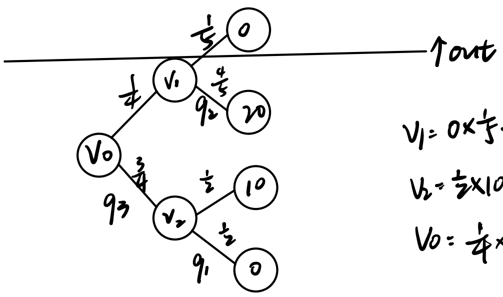


$V_1 = \frac{1}{5}\times 70 + \frac{4}{5}\times 20 = 30$

$V_2 = \frac{1}{2}\times 10 + \frac{1}{2}\times 0 = 5$

$V_0 = \frac{1}{4}\times 30 + \frac{3}{4}\times 5 = 11.25$

(c) up-and-out call $K=100$ $X=150$.

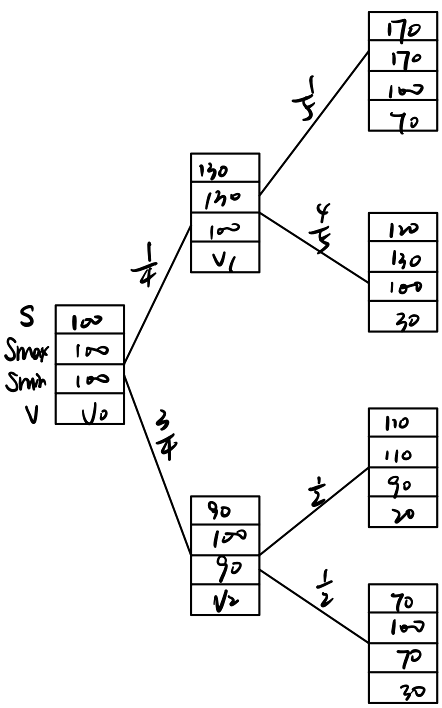


$V_1 = 0\times\frac{1}{5} + 20\times\frac{4}{5} = 16$

$V_2 = \frac{1}{2}\times 10 + \frac{1}{2}\times 0 = 5$

$V_0 = \frac{1}{4}\times 16 + \frac{3}{4}\times 5 = 7.75$

2.(a). lookback $S_{max} - S_{min}$.



$V_1 = \frac{1}{5}\times 70 + \frac{4}{5}\times 30 = 38$

$V_2 = \frac{1}{2}\times 20 + \frac{1}{2}\times 30 = 25$

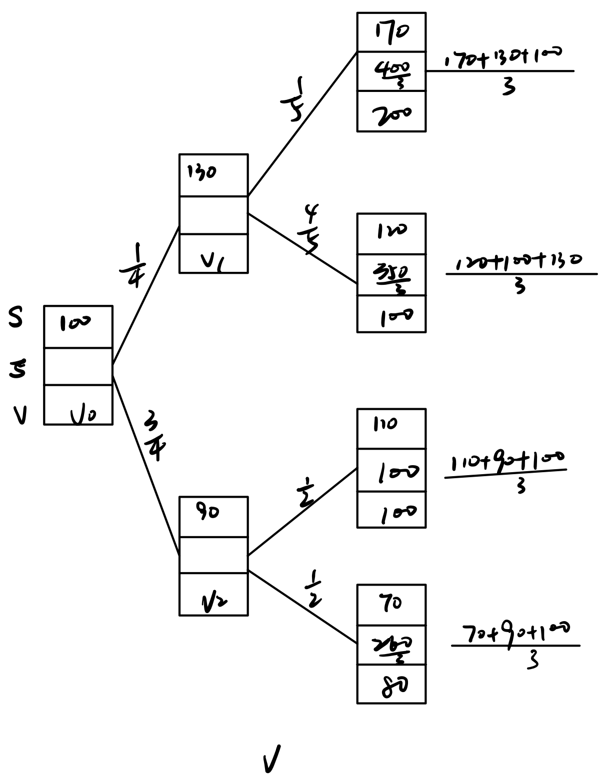
$V_0 = \frac{1}{4}\times 38 + \frac{3}{4}\times 25 = 28.25$

(b) $b = e^{-\delta t}\frac{V_+ - V_-}{S_+ - S_-}$ $\quad \delta = 0$

$= \frac{38-25}{130-90} = 0.325$

In order to hedge, Mr. Smith should short 0.325 shares of stock.

3. Asian option.



$V_1 = 200\times\frac{1}{5} + 100\times\frac{4}{5} = 120$

$V_2 = 100\times\frac{1}{2} + 80\times\frac{1}{2} = 90$

$V_0 = \frac{1}{4}\times 120 + \frac{3}{4}\times 90 = 97.5$