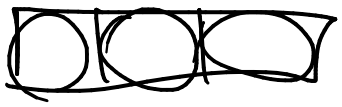
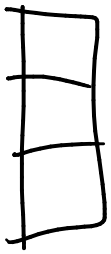
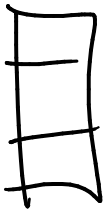
 PROJ. 3 ASSETS

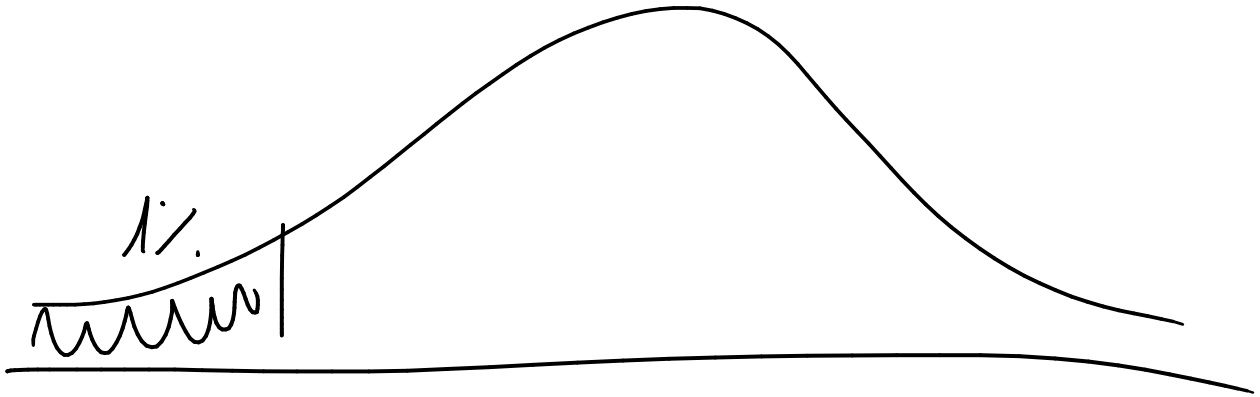
- $\mu_p =$   $E(R)$

$VAR_p =$   

- $STDEV_p = \sqrt{VAR_p}$

$\underline{mean} = 100\,(1+\mu_p)$

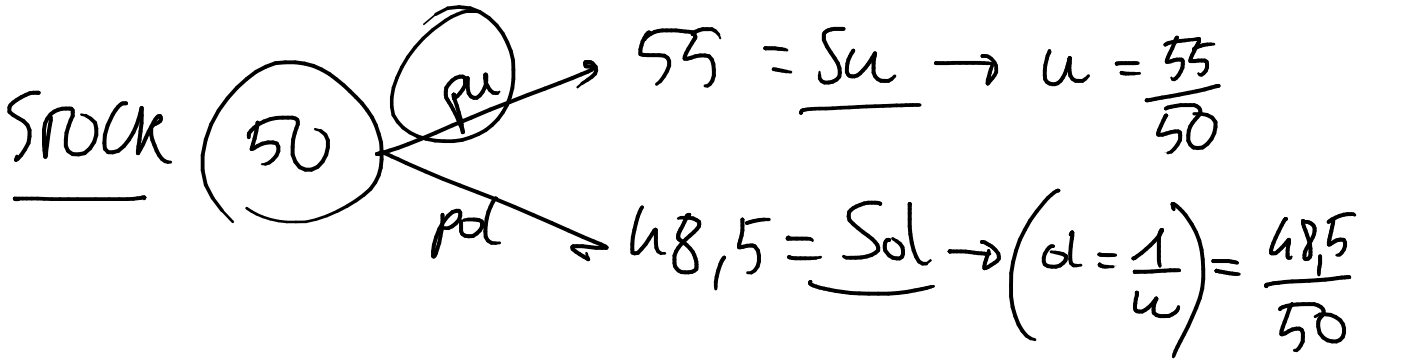
$\underline{STDDEV} = 100 \cdot STDEV_p$

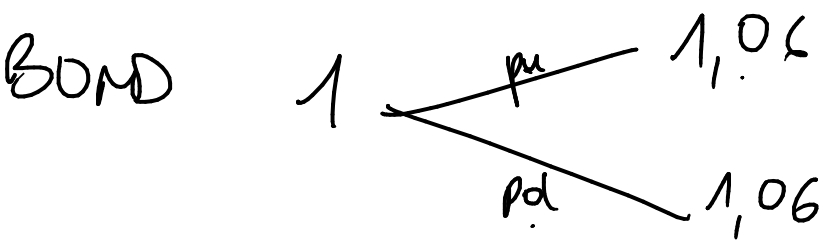


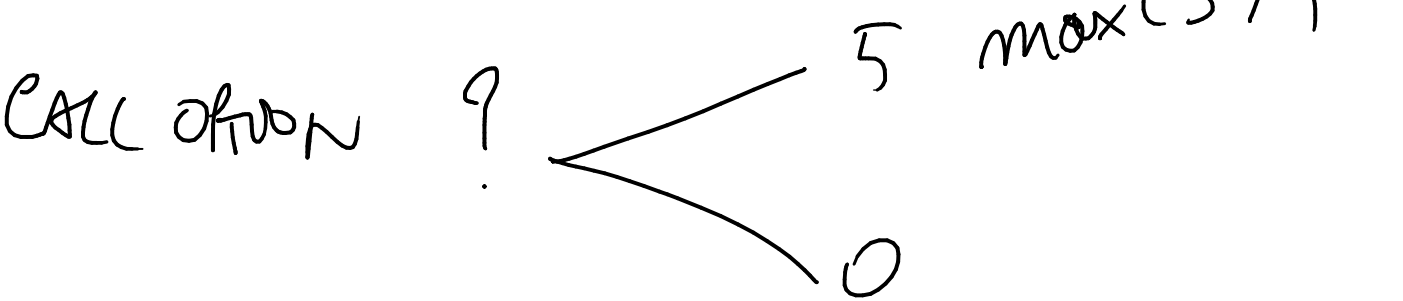
NORMINV (0,01 ; mean; stdev) = 22,32

VAR = 100 − 22,32 = 77,68

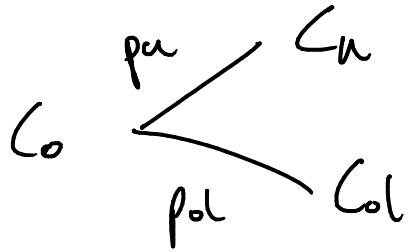
BINOMIAL OPTION PRICING MODEL:







PRICING BY RISK NEUTRAL PROBABILITIES:



$$C_0 = \frac{1}{1+r}\left[p_u \cdot C_u + p_d \cdot C_d\right]$$

$p_u = ?$

$p_d = ?$

$$\begin{cases} S_0 = \dfrac{1}{1+r}\left[p_u \cdot S_u + p_d \cdot S_d\right] \\ 1 = \dfrac{1}{1+r}\left[p_u \cdot 1{,}06 + p_d \cdot 1{,}06\right] \end{cases}$$

$1+r = 1{,}06$

$$\begin{cases} 1+r = p_u \cdot u + p_d \cdot d \\ 1 = p_u + p_d \end{cases}$$

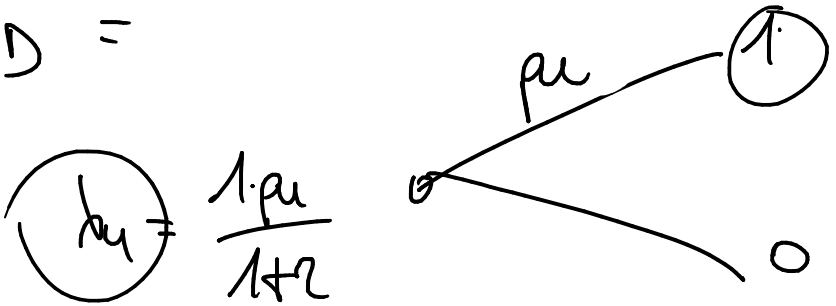
$$\underbrace{\begin{bmatrix} u & d \\ 1 & 1 \end{bmatrix}}_{A} \begin{bmatrix} p_u \\ p_d \end{bmatrix} = \underbrace{\begin{bmatrix} 1+r \\ 1 \end{bmatrix}}_{b}$$

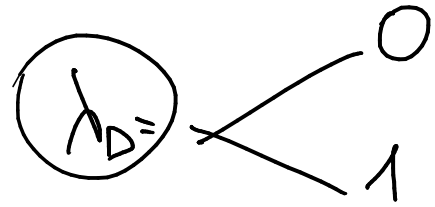
$$\begin{bmatrix} p_u \\ p_d \end{bmatrix} = A^{-1} \cdot b$$

$$C_0 = \frac{1}{1+r}\left[p_u \cdot C_u + p_d \cdot C_d\right]$$

$$\frac{p_u}{1+r} = \lambda_u = \text{STATE PRICES}$$

$$\frac{p_d}{1+r} = \lambda_D =$$





$$\frac{1 \cdot p_d}{1+r}$$

$$C = \lambda_u C_u + \lambda_D C_D$$

2° METHOD:

BUY $\Delta \cdot$ STOCK SELL $-C$

PORTFOLIO $= \Delta S - C$

$55\Delta - 5$

$=$

$48.5\Delta - 0$

$55\Delta - 5 = 48.5\Delta \qquad \Delta = 0{,}76$

PORTF VALUE TIME 1 $= 0{,}76 \cdot 48.5 = 37{,}30$

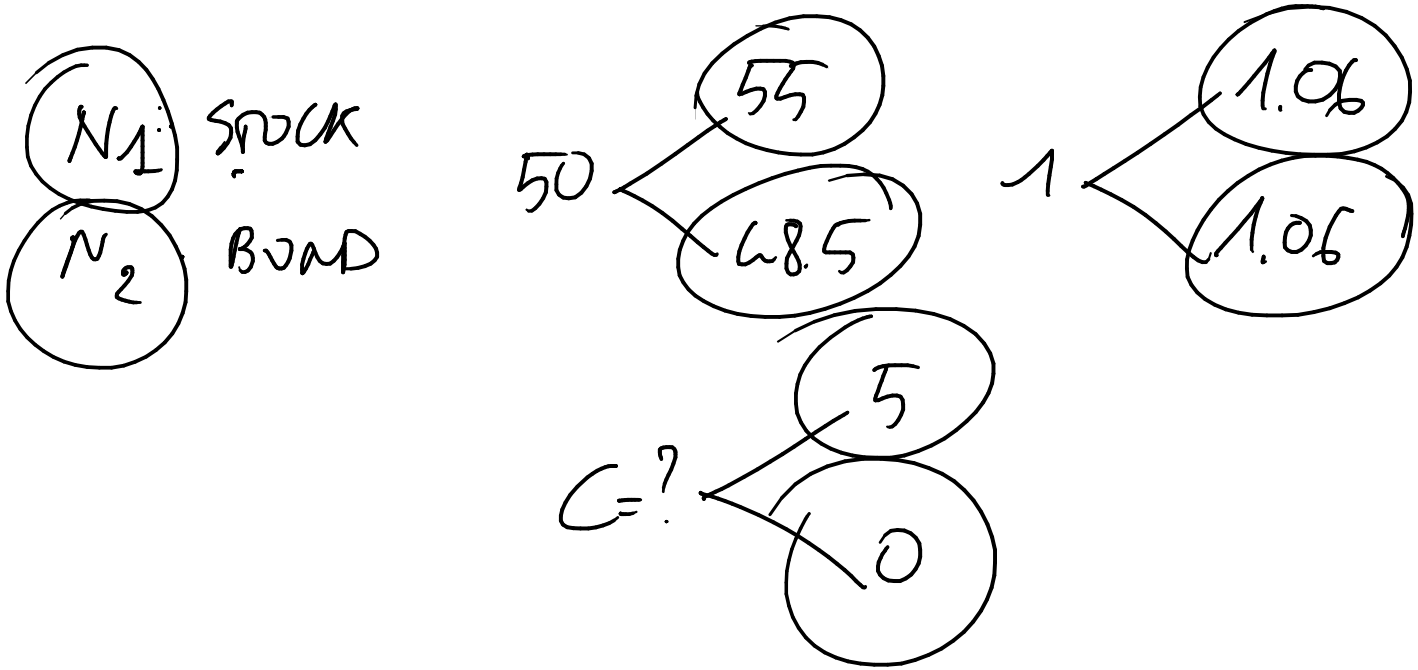
$$\text{PORT ATTIRE } \phi = \frac{37,30}{1,06} = 35,19$$

$$35,19 = \Delta \cdot 5 - C \qquad C = 35,19 - 0,76 \cdot 50$$

$$C = 3,26$$

3° METHOD:

PORTFOLIO OF STOCK & BOND



$$\begin{cases} N_1 \cdot 55 + N_2 \cdot 1{,}06 = 5 \\ N_1 \cdot 48{,}5 + N_2\, 1{,}06 = 0 \end{cases}$$

PRICING BY REPLICATION

$$\begin{bmatrix} 55 & 1{,}06 \\ 48{,}5 & 1{,}06 \end{bmatrix} \begin{bmatrix} N_1 \\ N_2 \end{bmatrix} = \begin{bmatrix} 5 \\ 0 \end{bmatrix}$$

$50 = S_0$ $\quad$ $1 = BOND_0$

CALL PRICE $= N_1 \cdot S_0 + N_2 \cdot BOND_0 = 3.26$

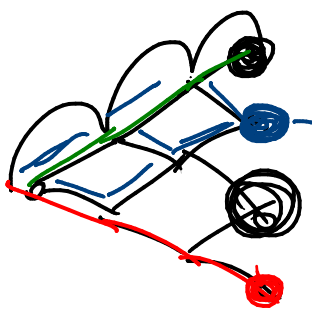
$$p_u = \frac{(1+r) - d}{u - d}$$

$$p_d = 1 - p_u$$

MULTIPERIOD BINOMIAL MODEL:

$$C_1 = \frac{1}{(1+r)^n}\left\{\sum_{k=0}^{n}\binom{n}{k} p_u^{\,k}\, p_d^{\,n-k} \cdot \max\left[S u^k d^{n-k} - X,\ 0\right]\right\}$$

$$\binom{3}{2} = \frac{n!}{k!(n-k)!} = \frac{3!}{2!\,1!} = 3$$



$u^3 d^0$ 1 PATH

$\binom{3}{2}$

$u^0 d^3$ 1 PATH

$n = 3$

$$\binom{3}{2} = \frac{3 \cdot 2 \cdot 1}{2 \cdot 1 \cdot 1} = \frac{3!}{2!\,1!} = 3$$

$$\binom{n}{k} = \frac{n!}{k!\,(n-k)!} = n(n-1)(n-2)\ldots 1$$

$$\binom{3}{1} = \frac{3!}{1!\,2!} = 3$$