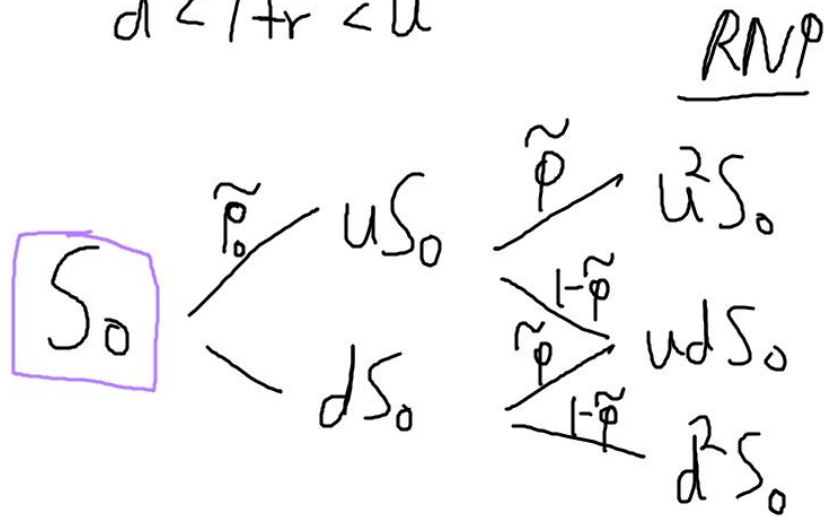


S_n has $\underline{n+1}$ possible values

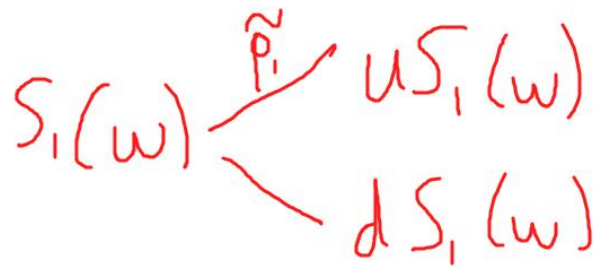
$$S_n \sim \text{Bin}(\tilde{p}, n) \cdot S_0$$

$$d < 1+r < u$$



$$\rightarrow \overset{\tilde{p}}{E}[S_1] = (1+r) \cdot \underline{S_0}$$

$$\tilde{p} = \frac{1+r-d}{u-d}$$



$$\tilde{p}u \underline{S_0} + (1-\tilde{p})d \underline{S_0} = (1+r) \underline{S_0}$$

$$\tilde{p}u + (1-\tilde{p})d = 1+r$$

digital option

$$N = 1$$

$W = \text{head}$

Stock

V_1

uS_0

1

head

dS_0

→ 0

tail

$\alpha \rightarrow$ stock $\delta^1 \rightarrow$ money market

$$\alpha uS_0 + \delta^1 (1+r) = 1 \quad \alpha S_0 (u-d) = 1$$

$$\alpha dS_0 + \delta^1 (1+r) = 0 \quad \alpha = \frac{1}{S_0(u-d)}$$