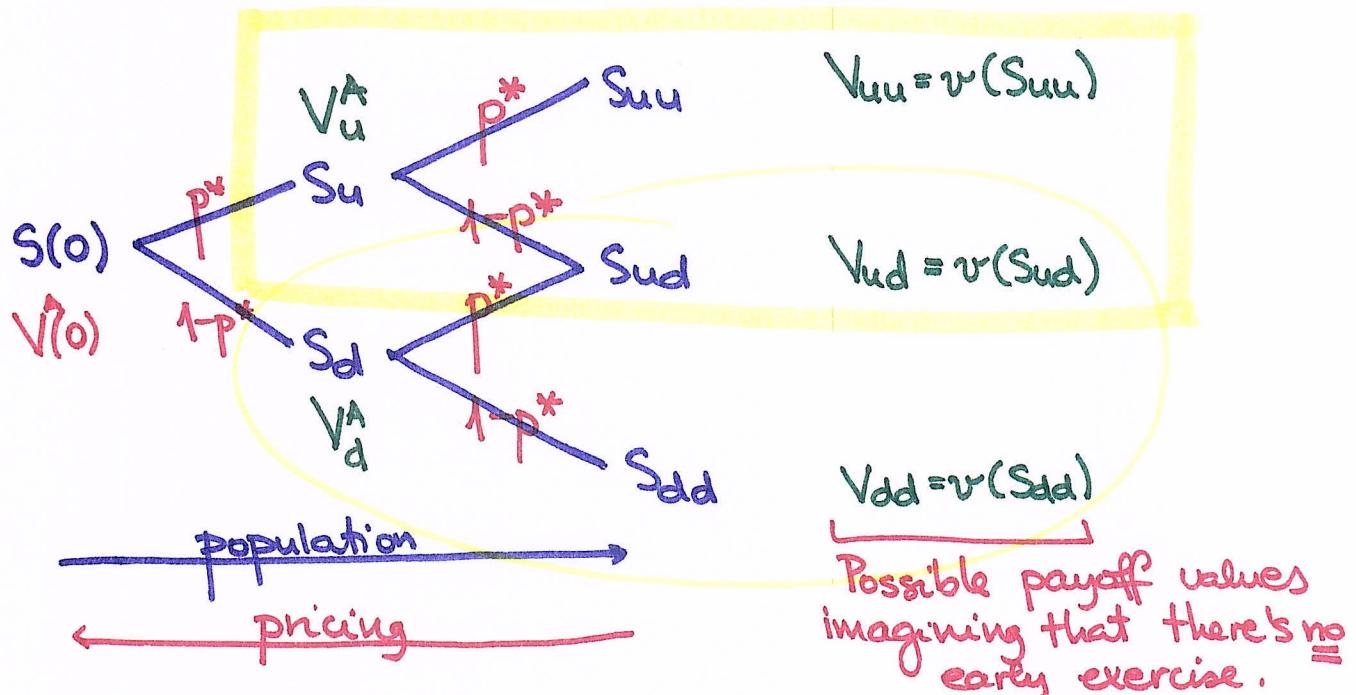


D: Apr 24<sup>TH</sup>, 2019.

## Binomial Pricing of American Options.



Consider an American option w/ payoff f'ction  $v(\cdot)$

(up) node: •  $\text{IE}_u \dots$  value of immediate exercise

•  $CV_u \dots$  continuation value

↳ if we don't exercise now, the option becomes a European option (since there are no more admissible early exercise dates left!)

$$\Rightarrow CV_u = e^{-r \cdot h} (p^* \cdot Vu + (1-p^*) \cdot Vud)$$

$$\Rightarrow V_u^A = \max (\text{IE}_u, CV_u)$$

and the option's owner decides whether to exercise early accordingly.

down

node :  $\begin{cases} \cdot IE_d \\ \cdot CV_d = e^{-rh} (p^* \cdot V_{ud} + (1-p^*) \cdot V_{dd}) \end{cases}$

$$V_d^A = \max(IE_d, CV_d)$$

Root

node :  $\begin{cases} \cdot IE_o \\ \cdot CV_o = e^{-r \cdot h} (p^* \cdot V_u^A + (1-p^*) \cdot V_d^A) \end{cases}$

$$V^A(0) = \max(IE_o, CV_o)$$

- Note:
- We can still dynamically replicate American options until we reach nodes in which early exercise is optimal.
  - The procedure is analogous in multi-period trees.