The Binomial Asset Pricing Model.

$S(0)$ ... the observable initial asset price

0 ———————— T

T ... time horizon (e.g., the exercise date of an option)

By convention: $\boxed{u > d}$

u ... up factor

d ... down factor

$S(0)$ — ROOT NODE

$\boxed{S_u = u \cdot S(0)}$ — up node

$\boxed{S_d = d \cdot S(0)}$ — down node

h ... length of a single period

one period: $\Rightarrow$ $\boxed{S(T) = S(h)}$ ... a r.v. denoting the time-T stock price w/ two possible values: S_u and S_d

As a random variable: simple return $= \boxed{\dfrac{S(T) - S(0)}{S(0)}}$

- $\dfrac{S_u - S(0)}{S(0)} = \dfrac{u \cdot \cancel{S(0)} - \cancel{S(0)}}{\cancel{S(0)}} = u - 1$
- $\dfrac{S_d - S(0)}{S(0)} = \dfrac{d \cdot \cancel{S(0)} - \cancel{S(0)}}{\cancel{S(0)}} = d - 1$