Suppose you have £1 in a bank today, at annual interest rate r.

$t = 0$ (today) : £1

$t = 1$ (1 yr. from now) : £ $1+r$

$t = 2$: £ $(1+r)^2$

$\vdots$

$t = n$: £ $(1+r)^n$

Time value of money

£ $(1+r)^n$ is the future value of £1 in n years

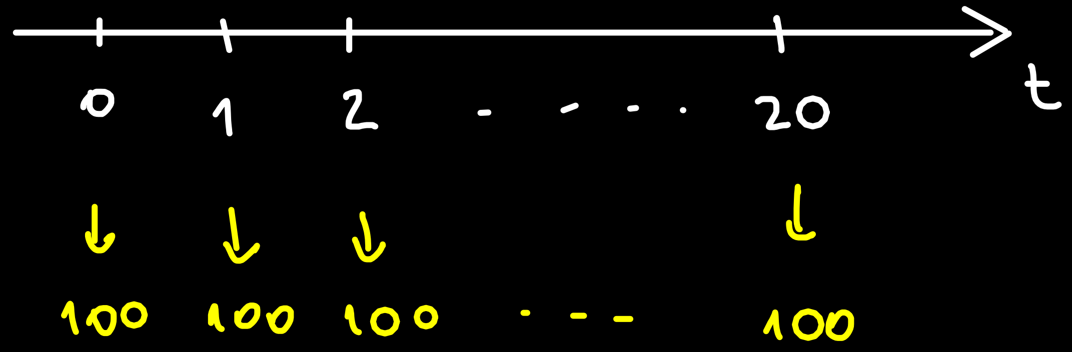
£1 is the present value of £ $(1+r)^n$ in n years

Discounting: given annual interest rate $\underline{\underline{r}}$, the PV of £A received n years from now is

$$\frac{A}{(1+r)^n}$$

Annuity bond:

annual interest rate $r = 0.05$



Recall:

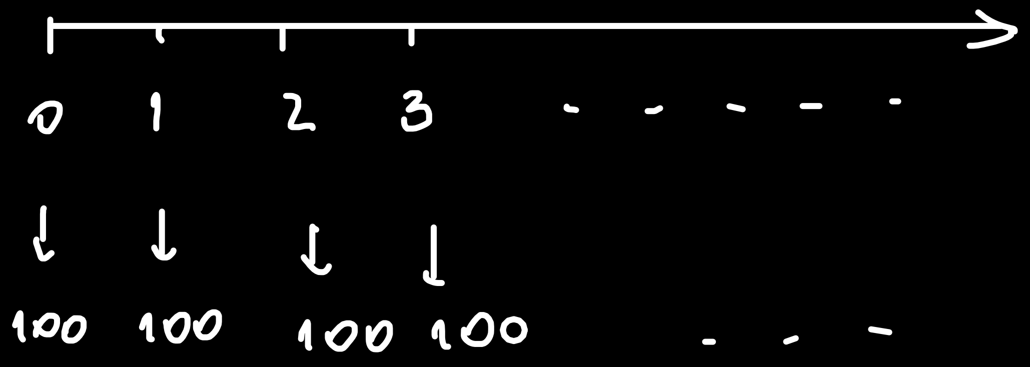
$$A + AR + AR^2 + \dots + AR^{n-1} = A\,\frac{1-R^n}{1-R}$$

$$PV = 100 + \frac{100}{1.05} + \frac{100}{1.05^2} + \dots + \frac{100}{1.05^{20}} = 100\,\frac{1-\left(\frac{1}{1.05}\right)^{21}}{1-\frac{1}{1.05}} =$$

$$= £1346.22$$

Perpetuity bond:

$r = 0.05$



Recall:

$$A + AR + AR^2 + \dots = A \frac{1}{1-R}$$

if $\underline{\underline{R < 1}}$

$$PV = 100 + \frac{100}{1.05} + \frac{100}{1.05^2} + \dots = 100 \frac{1}{1 - \frac{1}{1.05}} = £2100$$

$A = 100, \; R = \frac{1}{1.05} < 1$ ✓