Net present value

1. Time is discrete

   period 0, 1, 2, 3 ---

2. discount factor β

   interest rate r $\Rightarrow$ $\beta = \frac{1}{1+r}$

   periods $0 \overset{\beta}{\frown} 1 \overset{\beta}{\frown} 2 \overset{\beta}{\frown} 3$

   assuming constant dis. fac. β

Example 1:

stock: pay me d every period, starting from 0

β

PV of this stock? $PV = d + \beta \cdot d + \beta^2 \cdot d$ ---

$= \sum_{t=0}^{\infty} d \cdot \beta^t = d \cdot \frac{1}{1-\beta}$

PV of this stock?
assume. pays $\underline{T}$
$PV = d + \beta \cdot d \cdots + \beta^T \cdot d$

$= \sum_{t=0}^{T} d \cdot \beta^t = d \cdot \frac{1-\beta^{T+1}}{1-\beta}$

Example 2

purchase a bond $\beta = \frac{1}{1+r}$

period	0	1	2	3	4
	π	c	c	c	c
	pay to buy price				P

$$PV = -\text{price} + \beta \cdot c + \beta^2 \cdot c + \beta^3 \cdot c + \beta^4 \cdot (c+P)$$

PV at period 2? $= c + \beta \cdot c + \beta^2 \cdot (c+P)$

Example 3

stock period	0 $\overset{\beta}{\frown}$	1	2	3	4	5	--
		d_1		d_3		d_5	...

$$PV? = \beta \cdot d_1 + \beta^3 \cdot d_3 + \beta^5 \cdot d_5 \cdots$$

Example 4

stock period	0	$\overset{\beta_1}{\frown}$ 1	$\overset{\beta_2}{\frown}$ 2	$\overset{\beta_3}{\frown}$ 3	$\overset{\beta_4}{\frown}$ 4	$\overset{\beta_5}{\frown}$ 5
		d_1		d_3		d_5

$$PV_0 = \beta_1 \cdot d_1 + \beta_1 \cdot \beta_2 \cdot \beta_3 \cdot d_3 + \left(\prod_{t=1}^{5} \beta_t\right) \cdot d_5$$