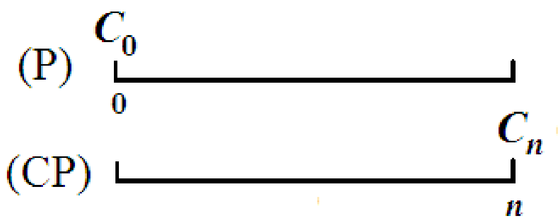
Discounting at a simple interest rate



The discounted amount is proportional to C_0 and "n"

$$D_{0,n} = C_n - C_0 = i \cdot C_0 \cdot n$$

$$\boxed{C_0 = \frac{C_n}{(1 + i \cdot n)}}$$

The process of calculating C_0 from C_n is called discounting at a simple interest rate (i)

Universidad Rey Juan Carlos

Discount at a simple interest rate

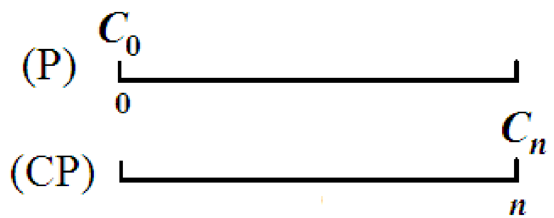
Discount at a simple interest $\equiv$ **Simple interest law**

$$C_0 = \frac{C_n}{(1+i\cdot n)} \quad \Leftrightarrow \quad C_n = C_0(1+i\cdot n)$$

$$\downarrow$$

$(\mathbf{1} + \boldsymbol{i}\,\boldsymbol{n})^{-\mathbf{1}}$ **Discount factor at a simple interest**

Relationship between simple interest rate and simple discount rate



Discount at a simple discount rate

$$C_0 = C_n(1 - d\cdot n)$$

Discount at a simple interest rate

$$C_0 = \frac{C_n}{1 + i\cdot n}$$

$$i \approx d \Leftrightarrow C_n(1 - d\cdot n) = \frac{C_n}{(1 + i\cdot n)}$$

$$\boxed{i \approx d \Leftrightarrow (1 - d\cdot n)(1 + i\cdot n) = 1} \Rightarrow \begin{cases} d = \dfrac{i}{1 + i\cdot n} \\ i = \dfrac{d}{1 - d\cdot n} \end{cases}$$

Compound discount

$$C_0 = C_n (1 - d)^n$$

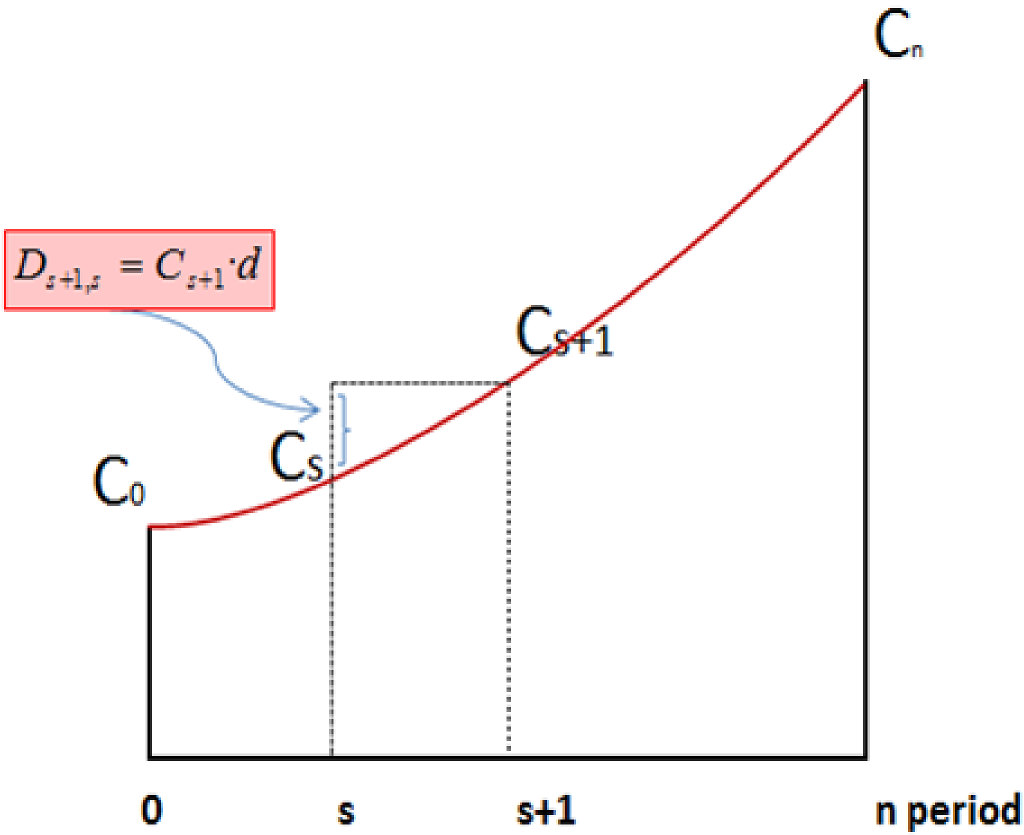
d is effective discount rate

$$\frac{D(s, s+1)}{C_{s+1}} = \frac{C_{s+1} - C_s}{C_{s+1}} = d$$

d represents the cost of anticipating each monetary unit from the nominal

Note: a temporary correspondence must exist between n and d, as both must be expressed using the same units (time)

Compound discount



Universidad Rey Juan Carlos

Equivalent discount rates

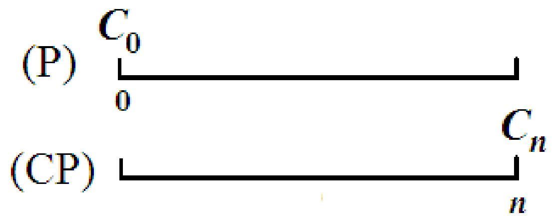
Two types of discount rates are said to be equivalent or indifferent using whichever chosen : they will produce the same discounted value of the same future value for the same period of time

In compound discount the equivalent interest rates are not related in a proportional way

$$\boxed{(1-d) = (1-d_m)^m} \Rightarrow \begin{cases} d = 1-(1-d_m)^m \\ d_m = 1-(1-d)^{\frac{1}{m}} \end{cases}$$

Universidad Rey Juan Carlos

Relationship between compund interest rate and compound discount rate



COMPOUND DISCOUNT

$$C_0 = C_n (1-d)^n$$

COMPOUND INTEREST RATE

$$C_0 = C_n (1+i)^{-n}$$

$$i \approx d \Leftrightarrow C_n (1-d)^n = C_n (1+i)^{-n}$$

$$\boxed{i \,\square\, d \Leftrightarrow (1-d)(1+i) = 1} \Rightarrow \begin{cases} d = \dfrac{i}{1+i} \\ i = \dfrac{d}{1-d} \end{cases}$$