

Formulas

Interest calculation

Simple interest

$$I = i \cdot t \cdot PV$$

$FV = PV + I \rightarrow PV \cdot (1+i \cdot t)$ (no effect of previously paid interest, typically Money Market, securities with lifetime < 1 year)

Commercial discount (interest is payed ahead)

$$D = d \cdot t \cdot FV$$

$$PV = FV - D \rightarrow FV \cdot (1-d \cdot t)$$
 (short time securities, T-bills, Promissory note)

$$i = d / (1-d) \rightarrow d = i / (1+i)$$

Compound interest

$$PV \text{ for 1st year...} = PV + I_1$$

$$PV \text{ for 2nd year...} = (PV + I_1) + I_2, \dots \rightarrow PV \cdot (1+i)^2$$

$$PV \text{ for 3rd year...} = ((PV + I_1) + I_2) + I_3$$

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$$PV \text{ for nth year...} = PV \cdot (1+i)^n$$

$$\text{Interest period} < 1 \text{ year} \rightarrow PV \cdot (1+i/m)^m$$

Effective interest rate

$$i_e = (1+i/m)^m - 1$$

Combined interest (When the whole time is not integer)

$$FV = PV \cdot (1+i)^n \cdot (1+i \cdot R)$$

Where $t = n + R$, $n \in \mathbb{Z}$ and $R < 1$ Interest period

Continues interest (Interest period is in every moment, if m within one year goes to infinity)

$$FV = PV \cdot e^{(f \cdot t)} \quad \dots \quad f = \ln(i_e + 1), \text{ consequently } = e^{f \cdot t} - 1$$

Real interest

... we consider the effect of inflation, then it must be true

$$PV \cdot (1+i_r) = PV \cdot (1+i_n) / (1+\pi) \rightarrow i_r = (1+i_n) / (1+\pi) - 1$$

Tax, FV after tax

$$FV = PV \cdot (1+i \cdot (1-T))^n$$

Note: The tax period is not always the same like the interest period! In most cases the tax period is one year.

PVPresent value

FVFuture value

IInterest (Amount)

DDiscount (Amount)

iInterest rate

dCommercial discount

nNumber of Interest periods

tTime

RRemaining time

TTax rate

fInterest intensity