Notes on Mathematics of Finance

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Definitions: P = present value; F = future value; r = interest rate per year; i = interest per interest period; n = total number of interest periods; m = number of interest periods per year; B_{curr} = current balance; B_{next} = next balance; R = rent payment

Formulas:

1. Interest

$i = \dfrac{r}{m}$.

2. Compound Interest

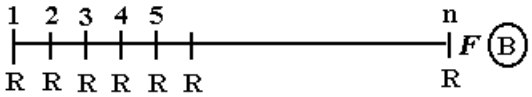
$F = (1+i)^n P$.

3. Annuity

Let $s_{n,i} = \dfrac{(1+i)^n - 1}{i}$ and $a_{n,i} = \dfrac{(1+i)^n - 1}{i(1+i)^n} = \dfrac{s_{n,i}}{(1+i)^n}$.

Increasing Annuity

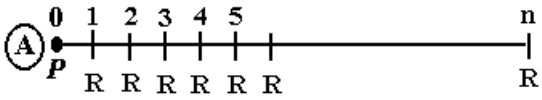
$F = s_{n,i} R$ or $R = \dfrac{F}{s_{n,i}}$.



F is computed at point B.

Decreasing Annuity

$P = a_{n,i} R$ or $R = \dfrac{P}{a_{n,i}}$



4. Amortization of Loans

$P = a_{n,i} R$, where P is the amount of loan.

$B_{next} = (1 + i)B_{curr} - R$.

The mortgage rent payment, R, includes partial payment on the loan plus interest due on the unpaid balance.