

Grant element calculation: Formulas

These formulas derive grant element, a measure of concessionality of a loan. Grant element is defined as the difference between its face value and the sum of the present value of debt service to be made by the borrower, expressed as a percentage of the face value of the loan. The assumptions are that the loan amount is fully disbursed and there are no fees other than interest payments.

I. Equal principal repayment	II. Lump sum debt service	III. Annuity
$\left(1 - \left(\frac{r}{n}\right)\right) * \left[1 - \left(\frac{1}{(1+d)^{n*g} - \frac{1}{(1+d)^{(n*m)}}}\right)\right]$ <p>, where</p> $d = (1 + D)^{\frac{1}{n}} - 1$	$1 - \frac{1 + r * m}{(1 + D)^m}$	$1 - PV_g - PV_N \text{ where}$ $PV_g = r * \frac{1 - \frac{1}{d}}{n * d} \text{ where } d = (1 + D)^{\frac{1}{n}} - 1, \text{ and } d_g = (1 + D)^g$ $PV_N = \left(\frac{r}{n}\right) * \left[\frac{1}{\left(1 + \frac{r}{n}\right)^N - 1} + 1\right] * \left(\frac{1}{d_g}\right) * \left(\frac{1 - \frac{1}{d_p}}{d}\right), \text{ where}$ $d_p = (1 + D)^p$

Variable

- (r)** Interest rate
- (m)** Maturity (year)
Grace period (year)
- (n)** Number of repayments per annum
- (D)** Discount Rate of 5 percent
- (p)** Principal repayment period(s) (year) (m-g)
- (N)** Total number of repayments (p*n)
- (g)** Interval (year)