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Present Value Formulas

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List of 19 Present Value Formulas

Present Value

1) Annuity Due for Present Value

fx Open Calculator

$$\mathrm{PV_{AD}} = \mathrm{PMT} \cdot \left(\frac{1 - \left(\frac{1}{(1+\mathrm{r})^{\mathrm{nPeriods}}} \right)}{\mathrm{r}} \right) \cdot (1 + \mathrm{r})$$

ex $$117.1429 = 60 \cdot \left(\frac{1 - \left(\frac{1}{(1+0.05)^{2}} \right)}{0.05} \right) \cdot (1 + 0.05)$$

2) Growing Annuity Payment using Present Value

fx Open Calculator

$$\mathrm{PMT_{initial}} = \mathrm{PV} \cdot \left(\frac{\mathrm{r} - \mathrm{g}}{1 - \left(\left(\frac{1+\mathrm{g}}{1+\mathrm{r}} \right)^{\mathrm{n}} \_ \{\mathrm{Periods}\} \right)} \right)$$

ex $$53.26087 = 100 \cdot \left(\frac{0.05 - 0.02}{1 - \left(\left(\frac{1+0.02}{1+0.05} \right)^{2} \right)} \right)$$

3) Number of Periods using Present Value of Annuity

Open Calculator

fx $$t = \frac{\ln\left(\left(1-\left(\frac{PVAnnuity}{C_f}\right)\right)^{-1}\right)}{\ln(1+r)}$$

ex $$74.28425 = \frac{\ln\left(\left(1-\left(\frac{1460}{1500}\right)\right)^{-1}\right)}{\ln(1+0.05)}$$

4) Present Value Continuous Compounding Factor

Open Calculator

fx $$F_{PV} = \left(e^{-r\cdot t}\right)$$

ex $$0.67032 = \left(e^{-0.05\cdot 8}\right)$$

5) Present Value Factor

Open Calculator

fx $$F_{PVA} = \frac{1-\left((1+r)^{-n_{Periods}}\right)}{r}$$

ex $$1.85941 = \frac{1-\left((1+0.05)^{-2}\right)}{0.05}$$

6) Present Value for Continuous Compounding

Open Calculator

fx $$PV_{cc} = \frac{FV}{e^{r\cdot n_{Periods}}}$$

ex $$29859.63 = \frac{33000}{e^{0.05\cdot 2}}$$

7) Present Value of Annuity

Open Calculator

$$\mathrm{PVAnnuity} = \left(\frac{\mathrm{p}}{\mathrm{IR}}\right) \cdot \left(1 - \left(\frac{1}{(1+\mathrm{IR})^{\mathrm{n}}} \_ \{\mathrm{Months}\}\right)\right)$$

ex $$5090.909 = \left(\frac{28000}{5.5}\right) \cdot \left(1 - \left(\frac{1}{(1+5.5)^{13}}\right)\right)$$

8) Present Value of Annuity with Continuous Compounding

Open Calculator

$$\mathrm{PVAnnuity} = \mathrm{C_f} \cdot \left(\frac{1 - e^{-\mathrm{r} \cdot \mathrm{n_{Periods}}}}{e^{\mathrm{r}} - 1}\right)$$

ex $$2784.1 = 1500 \cdot \left(\frac{1 - e^{-0.05 \cdot 2}}{e^{0.05} - 1}\right)$$

9) Present Value of Deferred Annuity

Open Calculator

$$\mathrm{PV_{DA}} = \mathrm{P_O} \cdot \frac{1 - (1 + (\mathrm{IR} \cdot 0.01))^{-\mathrm{n}} \_ \{\mathrm{Periods}\}}{\left(1 + (\mathrm{IR} \cdot 0.01)^{\mathrm{t}} \_ \{\mathrm{d}\} \cdot (\mathrm{IR} \cdot 0.01)\right)}$$

ex $$253.869 = 2500 \cdot \frac{1 - (1 + (5.5 \cdot 0.01))^{-2}}{\left(1 + (5.5 \cdot 0.01)^{9} \cdot (5.5 \cdot 0.01)\right)}$$

10) Present Value of Deferred Annuity based on Annuity Due

Open Calculator

$$PV_{DA} = P_D \cdot \frac{1 - (1 + (IR \cdot 0.01))^{-n\_\{Periods\}}}{(1 + (IR \cdot 0.01))^{t_d - 1} \cdot (IR \cdot 0.01)}$$

ex $$132.3366 = 110 \cdot \frac{1 - (1 + (5.5 \cdot 0.01))^{-2}}{(1 + (5.5 \cdot 0.01))^{9-1} \cdot (5.5 \cdot 0.01)}$$

11) Present Value of Future Sum given compounding periods

Open Calculator

$$PV = \frac{FV}{\left(1 + \left(\frac{\%RoR}{C_n}\right)\right)^{C_n \cdot n_{Periods}}}$$

ex $$17.45242 = \frac{33000}{\left(1 + \left(\frac{4.5}{11}\right)\right)^{11 \cdot 2}}$$

12) Present Value of Future Sum given Number of Periods

Open Calculator

$$PV = \frac{FV}{\exp(\%RoR \cdot n_{Periods})}$$

ex $$4.072524 = \frac{33000}{\exp(4.5 \cdot 2)}$$

13) Present Value of Future Sum given Total Number of Periods

Open Calculator

fx $$\mathrm{PV} = \frac{\mathrm{FV}}{(1+\mathrm{IR})^{\mathrm{t}}}$$

ex $$0.010356 = \frac{33000}{(1+5.5)^{8}}$$

14) Present Value of Growing Annuity

Open Calculator

fx $$\mathrm{PV_{ga}} = \left(\frac{\mathrm{II}}{\mathrm{r}-\mathrm{g}}\right)\cdot\left(1-\left(\frac{1+\mathrm{g}}{1+\mathrm{r}}\right)^{\mathrm{n_{Periods}}}\right)$$

ex $$3755.102 = \left(\frac{2000}{0.05-0.02}\right)\cdot\left(1-\left(\frac{1+0.02}{1+0.05}\right)^{2}\right)$$

15) Present Value of Lumpsum

Open Calculator

fx $$\mathrm{PV_L} = \frac{\mathrm{FV}}{(1+\mathrm{IR_P})^{\mathrm{n}}} - \{\mathrm{Periods}\}$$

ex $$29369.88 = \frac{33000}{(1+0.06)^{2}}$$

16) Present Value of Ordinary Annuities and Amortization

Open Calculator

fx $$PV = PMT \cdot \left(\frac{1 - (1 + r)^{-n_c}}{r} \right)$$

ex $$593.9185 = 60 \cdot \left(\frac{1 - (1 + 0.05)^{-14}}{0.05} \right)$$

17) Present Value of Stock with Constant Growth

Open Calculator

fx $$P = \frac{D1}{(\%RoR \cdot 0.01) - g}$$

ex $$10 = \frac{0.25}{(4.5 \cdot 0.01) - 0.02}$$

18) Present Value of Stock with Zero Growth

Open Calculator

fx $$P = \frac{D}{\%RoR}$$

ex $$7.777778 = \frac{35}{4.5}$$

19) PV of Perpetuity

Open Calculator

fx $$PV_p = \frac{D}{DR}$$

ex $$291.6667 = \frac{35}{0.12}$$

Variables Used

- **%RoR** Rate of Return
- C_f Cashflow per Period
- C_n Compounding Periods
- **D** Dividend
- **D1** Estimated Dividends for Next Period
- **DR** Discount Rate
- F_{PV} PV Continuous Compounding Factor
- F_{PVA} Annuity Present Value Factor
- **FV** Future Value
- **g** Growth Rate
- **II** Initial Investment
- **IR** Interest Rate
- IR_P Interest Rate per Period
- n_c Total Number of Times Compounded
- n_{Months} Number of Months
- $n_{Periods}$ Number of Periods
- **p** Monthly Payment
- **P** Price of Stock
- P_D Annuity Payment Due
- P_O Ordinary Annuity Payment
- **PMT** Payment made in Each Period
- $PMT_{initial}$ Initial Payment

- **PV** Present Value
- **PV_{AD}** Annuity Due Present Value
- **PV_{cc}** Present Value with Continuous Compounding
- **PV_{DA}** Present Value of Deferred Annuity
- **PV_{ga}** Present Value of Growing Annuity
- **PV_{L}** Present Value of Lumpsum
- **PV_{p}** PV of Perpetuity
- **PVAnnuity** Present Value of Annuity
- **r** Rate per Period
- **t** Total Number of Periods
- **t_{d}** Deferred Periods

Constants, Functions, Measurements used

- Constant: **e**, 2.71828182845904523536028747135266249
  Napier's constant
- Function: **exp**, exp(Number)
  n an exponential function, the value of the function changes by a constant factor for every unit change in the independent variable.
- Function: **ln**, ln(Number)
  The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.

Check other formula lists

- **Basics of Time Value of Money Formulas**
- **Future value Formulas**
- **Present Value Formulas**

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