calculatoratoz.com

unitsconverters.com

Time Value of Money Formulas

Calculators! Examples! Conversions!

List of 43 Time Value of Money Formulas

Time Value of Money

1) Annuity Due Payment using Future Value

Open Calculator

fx $$P_D = \frac{FV \cdot \frac{r}{\left((1+r)^t\right)-1}}{1+r}$$

ex $$3291.257 = \frac{33000 \cdot \frac{0.05}{\left((1+0.05)^8\right)-1}}{1+0.05}$$

2) Doubling Time

Open Calculator

fx $$DT = \log 10 \frac{2}{\log 10}\left(1 + \frac{\%RoR}{100}\right)$$

ex $$15.7473 = \log 10 \frac{2}{\log 10}\left(1 + \frac{4.5}{100}\right)$$

3) Doubling Time (Continuous Compounding)

Open Calculator

fx $$DT_{CC} = \frac{\ln(2)}{\frac{\%RoR}{100}}$$

ex $$15.40327\text{Year} = \frac{\ln(2)}{\frac{4.5}{100}}$$

4) Doubling Time (Simple Interest)

Open Calculator

fx $$DT_{SI} = \frac{100}{\%i}$$

ex $$14.28571\text{Year} = \frac{100}{7}$$

5) Hamada Equation

Open Calculator

fx $$\beta_L = \beta_{UL} \cdot \left(1 + (1 - T_{\%}) \cdot R_{D/E}\right)$$

ex $$272.16 = 7.2 \cdot (1 + (1 - 0.08) \cdot 40)$$

6) Number of Periods

Open Calculator

fx $$n_{Periods} = \frac{\ln\left(\frac{FV}{PV}\right)}{\ln(1 + r)}$$

ex $$118.8578 = \frac{\ln\left(\frac{33000}{100}\right)}{\ln(1 + 0.05)}$$

7) Perpetuity Payment

Open Calculator

fx $$PMT_{perpetuity} = PV \cdot r$$

ex $$5 = 100 \cdot 0.05$$

8) Perpetuity Yield

Open Calculator

fx $$Y = \frac{PMT_{perpetuity}}{PV}$$

ex $$0.05 = \frac{5}{100}$$

9) Rule of 69

Open Calculator

fx $$DT = \frac{69}{i}$$

ex $$3.45 = \frac{69}{20}$$

10) Rule of 72

Open Calculator

fx $$\text{Rule of 72} = \frac{72}{i}$$

ex $$3.6 = \frac{72}{20}$$

Future value

11) Annuity Due for Future Value

Open Calculator

fx $$FV_{AD} = PMT \cdot \frac{(1+r)^{n_{Periods}} - 1}{r} \cdot (1+r)$$

ex $$129.15 = 60 \cdot \frac{(1+0.05)^{2} - 1}{0.05} \cdot (1+0.05)$$

12) Annuity Payment using Future Value

Open Calculator

fx $$PMT_{Annuity} = \frac{FV_A}{((1+r)^{n} \_ \{Periods\}) - 1}$$

ex $$561365.9 = \frac{57540}{\left((1+0.05)^{2}\right) - 1}$$

13) Future Value Factor

Open Calculator

fx $$F_{FV} = (1+r)^{n} \_ \{Periods\}$$

ex $$1.1025 = (1+0.05)^{2}$$

14) Future Value of Annuity

fx Open Calculator

$$FV_A = \left(\frac{p}{IR \cdot 0.01}\right) \cdot ((1 + (IR \cdot 0.01))^n \_ \{Periods\} - 1)$$

ex
$$57540 = \left(\frac{28000}{5.5 \cdot 0.01}\right) \cdot \left((1 + (5.5 \cdot 0.01))^2 - 1\right)$$

15) Future Value of Annuity with Continuous Compounding

fx Open Calculator

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

ex
$$3076.907 = 1500 \cdot \left(\frac{e^{0.05 \cdot 2} - 1}{e^{0.05} - 1}\right)$$

16) Future Value of Growing Annuity

fx Open Calculator

$$FV_{GA} = II \cdot \frac{(1 + r)^{n_{Periods}} - (1 + g)^{n_{Periods}}}{r - g}$$

ex
$$4140 = 2000 \cdot \frac{(1 + 0.05)^2 - (1 + 0.02)^2}{0.05 - 0.02}$$

17) Future Value of Lumpsum

fx Open Calculator

$$FV_L = PV \cdot (1 + IR_P)^n \_ \{Periods\}$$

ex
$$112.36 = 100 \cdot (1 + 0.06)^2$$

18) Future Value of Ordinary Annuities and Sinking Funds

Open Calculator

fx $$FV_O = C_f \cdot \frac{(1+r)^{n_c} - 1}{r}$$

ex $$29397.95 = 1500 \cdot \frac{(1+0.05)^{14} - 1}{0.05}$$

19) Future Value of Present Sum given Compounding Periods

Open Calculator

fx $$FV = PV \cdot \left(1 + \left(\frac{\%RoR \cdot 0.01}{C_n}\right)\right)^{C_n \cdot n_{Periods}}$$

ex $$109.3973 = 100 \cdot \left(1 + \left(\frac{4.5 \cdot 0.01}{11}\right)\right)^{11 \cdot 2}$$

20) Future Value of Present Sum given Number of Periods

Open Calculator

fx $$FV = PV \cdot \exp(\%RoR \cdot n_{Periods} \cdot 0.01)$$

ex $$109.4174 = 100 \cdot \exp(4.5 \cdot 2 \cdot 0.01)$$

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

Open Calculator

fx $$FV = PV \cdot (1 + (\%RoR \cdot 0.01))^{n} \_ \{Periods\}$$

ex $$109.2025 = 100 \cdot (1 + (4.5 \cdot 0.01))^{2}$$

22) Future Value with Continuous Compounding

Open Calculator

fx $$FV_{CC} = PV \cdot \left(e^{\%RoR \cdot n_{cp} \cdot 0.01}\right)$$

ex $$114.4537 = 100 \cdot \left(e^{4.5 \cdot 3 \cdot 0.01}\right)$$

23) Growing Annuity Payment using Future Value

Open Calculator

fx $$PMT_{initial} = \frac{FV \cdot (r - g)}{\left((1 + r)^{n_{Periods}}\right) - \left((1 + g)^{n_{Periods}}\right)}$$

ex $$15942.03 = \frac{33000 \cdot (0.05 - 0.02)}{\left((1 + 0.05)^{2}\right) - \left((1 + 0.02)^{2}\right)}$$

24) Number of Periods using Future Value

Open Calculator

fx $$n_{Periods} = \frac{\ln\left(1 + \left(\frac{FV_A \cdot r}{C_f}\right)\right)}{\ln(1 + r)}$$

ex $$21.94906 = \frac{\ln\left(1 + \left(\frac{57540 \cdot 0.05}{1500}\right)\right)}{\ln(1 + 0.05)}$$

Present value

25) Annuity Due for Present Value

fx Open Calculator

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

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

26) Growing Annuity Payment using Present Value

fx Open Calculator

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

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

27) 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 $$74.28425 = \frac{\ln\left(\left(1 - \left(\frac{1460}{1500}\right)\right)^{-1}\right)}{\ln(1 + 0.05)}$$

28) Present Value Continuous Compounding Factor

Open Calculator

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

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

29) Present Value Factor

Open Calculator

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

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

30) Present Value for Continuous Compounding

Open Calculator

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

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

31) Present Value of Annuity

fx Open Calculator

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

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

32) Present Value of Annuity with Continuous Compounding

fx Open Calculator

$$\text{PVAnnuity} = \text{C}_{\text{f}} \cdot \left(\frac{1 - e^{-\text{r}\cdot\text{n}_{\text{Periods}}}}{e^{\text{r}} - 1}\right)$$

ex
$$2784.1 = 1500 \cdot \left(\frac{1 - e^{-0.05\cdot2}}{e^{0.05} - 1}\right)$$

33) Present Value of Deferred Annuity

fx Open Calculator

$$\text{PV}_{\text{DA}} = \text{P}_{\text{O}} \cdot \frac{1 - (1 + (\text{IR}\cdot0.01))^{-\text{n}} \_ \{\text{Periods}\}}{(1 + (\text{IR}\cdot0.01)^{\text{t}} \_ \{\text{d}\} \cdot (\text{IR}\cdot0.01))}$$

ex
$$253.869 = 2500 \cdot \frac{1 - (1 + (5.5\cdot0.01))^{-2}}{\left(1 + (5.5\cdot0.01)^{9} \cdot (5.5\cdot0.01)\right)}$$

34) Present Value of Deferred Annuity based on Annuity Due

Open Calculator

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

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

35) Present Value of Future Sum given compounding periods

Open Calculator

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

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

36) Present Value of Future Sum given Number of Periods

Open Calculator

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

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

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

Open Calculator

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

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

38) Present Value of Growing Annuity

Open Calculator

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

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

39) Present Value of Lumpsum

Open Calculator

fx $$PV_{L} = \frac{FV}{(1+IR_{P})^{n}}{}_{\{Periods\}}$$

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

40) Present Value of Ordinary Annuities and Amortization

Open Calculator

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

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

41) Present Value of Stock with Constant Growth

Open Calculator

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

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

42) Present Value of Stock with Zero Growth

Open Calculator

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

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

43) PV of Perpetuity

Open Calculator

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

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

Variables Used

- **%i** Annual Interest Rate
- **%RoR** Rate of Return
- C_f Cashflow per Period
- C_n Compounding Periods
- **D** Dividend
- **D1** Estimated Dividends for Next Period
- **DR** Discount Rate
- **DT** Doubling Time
- DT_{CC} Doubling Time Continuous Compounding *(Year)*
- DT_{SI} Doubling Time Simple Interest *(Year)*
- F_{FV} Future Value Factor
- F_{PV} PV Continuous Compounding Factor
- F_{PVA} Annuity Present Value Factor
- **FV** Future Value
- FV_A Future Value of Annuity
- FV_{ACC} FV of Annuity with Continuous Compounding
- FV_{AD} Annuity Due Future Value
- FV_{CC} Future Value with Continuous Compounding
- FV_{GA} Future Value of Growing Annuity
- FV_L Future Value of Lumpsum
- FV_O Future Value of Ordinary Annuity
- **g** Growth Rate

- **i** Rate of Interest as Whole Number
- **II** Initial Investment
- **IR** Interest Rate
- IR_P Interest Rate per Period
- n_c Total Number of Times Compounded
- n_{cp} Number of Compounding Periods
- 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
- $PMT_{Annuity}$ Annuity Payment
- $PMT_{initial}$ Initial Payment
- $PMT_{perpetuity}$ Perpetuity 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
- **$R_{D/E}$** Debt to Equity (D/E)
- **Rule of 72** Rule of 72
- **t** Total Number of Periods
- **$T_{\%}$** Tax Rate
- **t_d** Deferred Periods
- **Y** Perpetuity Yield
- **β_L** Leveraged Beta
- **β_{UL}** Unleveraged Beta

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.
- Function: **log10**, log10(Number)
  The common logarithm, also known as the base-10 logarithm or the decimal logarithm, is a mathematical function that is the inverse of the exponential function.
- Measurement: **Time** in Year (Year)
  Time Unit Conversion

Check other formula lists

- Capital Budgeting Formulas
- Cash Management Formulas
- Debt Management Formulas
- Time Value of Money Formulas

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

4/19/2024 | 7:19:55 AM UTC *Please leave your feedback here...*