

TIME VALUE OF MONEY FORMULA SHEET

#	TVM Formula For:	Annual Compounding	Compounded/Payments (m) Times per Year	Continuous Compounding
1	Future Value of a Lump Sum. (FVIF _{i,n})	$FV_n = PV(1+i)^n$	$FV_n = PV(1+i/m)^{(m \times n)}$	$FV_n = PV(e)^{(i \times n)}$
2	Present Value of a Lump Sum. (PVIF _{i,n})	$PV = \frac{FV}{(1+i)^n}$ or $PV = FV(1+i)^{-n}$	$PV = \frac{FV}{(1+i/m)^{(m \times n)}$ or $PV = FV(1+i/m)^{-(m \times n)}$	$PV = \frac{FV}{(e)^{(i \times n)}$ or $PV = FV(e)^{-(i \times n)}$
3	Future Value of an Annuity. (FVIFA _{i,n})	$FVA_n = CF \left[\frac{(1+i)^n - 1}{i} \right]$	$FVA_n = CF \left[\frac{(1+i/m)^{(m \times n)} - 1}{i/m} \right]$	
4	Present Value of an Annuity. (PVIFA _{i,n})	$PVA_n = CF \left[\frac{1 - (1+i)^{-n}}{i} \right]$	$PVA_n = CF \left[\frac{1 - (1+i/m)^{-(m \times n)}}{i/m} \right]$	
5	Present Value of Perpetuity. (PVA _∞)	$PVA_{\infty} = \frac{CF}{i}$	$PVA_{\infty} = \frac{CF}{[(1+i/m)^m - 1]}$	
6	Effective Annual Rate given the APR.	$EAR = APR = i$	$EAR = \left(1 + \frac{i}{m}\right)^m - 1$	$EAR = e^i - 1$
7	The length of time required for a PV to grow to a FV.	$n = \frac{\ln(FV/PV)}{\ln(1+i)}$	$n = \frac{\ln(FV/PV)}{m \times \ln(1+i/m)}$	$n = \frac{\ln(FV/PV)}{i}$
8	The APR required for a PV to grow to a FV.	$i = \left(\frac{FV}{PV}\right)^{(1/n)} - 1$	$i = m \times \left[\left(\frac{FV}{PV}\right)^{[1/(m \times n)]} - 1 \right]$	$i = \frac{\ln(FV/PV)}{n}$
9	Present Value of a Growing Annuity.	$PVA_n = \frac{CF_0(1+g)}{(i-g)} \left[1 - \left(\frac{1+g}{1+i}\right)^n \right]$		
10	Present Value of a Growing Perpetuity.	$PVA_{\infty} = \frac{CF_0(1+g)}{(i-g)}$		
11	The length of time required for a series of PMT's to grow to a future amount (FVA _n).	$n = \frac{\ln \left[\frac{(FVA)(i)}{CF} + 1 \right]}{\ln(1+i)}$	$n = \frac{\ln \left[\left(\frac{i}{m}\right) \left(\frac{FVA}{CF} + \frac{m}{i}\right) \right]}{m \times [\ln(1+i/m)]}$	
12	The length of time required for a series of PMT's to exhaust a specific present amount (PVA _n).	$n = -\frac{\ln \left[1 - \frac{(PVA)(i)}{CF} \right]}{\ln(1+i)}$, for PVA(i) < CF	$n = -\frac{\ln \left[1 - \frac{(PVA)(i/m)}{CF} \right]}{m \times [\ln(1+i/m)]}$, for PVA(i/m) < CF	

Legend

i = APR, the nominal or Annual Percentage Rate	n = the number of periods
m = the number of compounding periods per year	EAR = the Effective Annual Rate
\ln = the natural logarithm, the logarithm to the base e	e = the base of the natural logarithm $\approx 2.71828...$ (Calculator: $1 \rightarrow e^x$)
$CF = PMT$ = the periodic payment or cash flow	<i>Perpetuity</i> = an infinite annuity

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