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. $[FVIF_{(r,t)}]$	$FV_t = PV(1+r)^t$	$FV_t = PV(1+r/m)^{tm}$	$FV_t = PV(e)^{rt}$
2	Present Value of a Lump Sum. $[PVIF_{(r,t)}]$	$PV = FV_t(1+r)^{-t}$	$PV = FV_t(1+r/m)^{-tm}$	$PV = FV_t(e)^{-rt}$
3	Annuity Future Value. $[FVIFA_{(r,t)}]$	$AFV = C\left[\frac{(1+r)^t - 1}{r}\right]$	$AFV = C\left[\frac{(1+r/m)^{tm} - 1}{r/m}\right]$	
4	Annuity Present Value. $[PVIFA_{(r,t)}]$	$APV = C\left[\frac{1-(1+r)^{-t}}{r}\right]$	$APV = C\left[\frac{1-(1+r/m)^{-tm}}{r/m}\right]$	
5	Present Value for a Perpetuity. $[PV_P]$	$PV_{perpetuity} = \frac{C}{r}$	$PV_{perpetuity} = \frac{C}{[(1+r/m)^m - 1]}$	
6	Effective Annual Rate given the APR.	$EAR = APR$	$EAR = (1+r/m)^m - 1$	$EAR = e^r - 1$
7	APR given the Effective Annual Rate.	$APR = EAR$	$APR = m\left[(1+EAR)^{1/m} - 1\right]$	$APR = \ln(1+EAR)$
8	The length of time required for a PV to grow to a FV.	$t = \frac{\ln(FV/PV)}{\ln(1+r)}$	$t = \frac{\ln(FV/PV)}{m[\ln(1+r/m)]}$	$t = \frac{\ln(FV/PV)}{r}$
9	The APR required for a PV to grow to a FV.	$r = \left(\frac{FV}{PV}\right)^{1/t} - 1$	$r = m\left[\left(\frac{FV}{PV}\right)^{1/(tm)} - 1\right]$	$r = \frac{\ln(FV/PV)}{t}$
10	Present Value of a Growing Annuity.	$APV_{Growing} = \frac{C_0(1+g)}{(r-g)}\left[1-\left(\frac{1+g}{1+r}\right)^t\right]$		
11	The length of time required for a series of Cash Flows (C) to grow to a future amount (AFV_t).	$t = \frac{\ln\left[\frac{(AFV)(r)}{C}+1\right]}{\ln(1+r)}$	$t = \frac{\ln\left[\left(\frac{r}{m}\right)\left(\frac{AFV}{C}+\frac{m}{r}\right)\right]}{m[\ln(1+r/m)]}$	
12	The length of time required for a series of Cash Flows (C) to exhaust a specific present amount (APV).	$t = -\frac{\ln\left[1-\frac{(APV)(r)}{C}\right]}{\ln(1+r)}$, for $[(APV)(r)] < C$	$t = -\frac{\ln\left[1-\frac{(APV)(r/m)}{C}\right]}{m[\ln(1+r/m)]}$, for $[(APV)(r/m)] < C$	

Legend

r = the quoted or Annual Percentage Rate	*t* = 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 ≈ 2.71828
C = the periodic payment or cash flow	*Perpetuity* = an infinite annuity

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