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. ($FVIF_{k,n}$)	$FV = PV(1+k)^{n}$	$FV = PV\left(1+k/m\right)^{nm}$	$FV = PV(e)^{kn}$
2	Present Value of a Lump Sum. ($PVIF_{k,n}$)	$PV = FV(1+k)^{-n}$	$PV = FV(1+k/m)^{-nm}$	$PV = FV(e)^{-kn}$
3	Future Value of an Annuity. ($FVIFA_{k,n}$)	$FVA = PMT\left[\frac{(1+k)^{n}-1}{k}\right]$	$FVA = PMT\left[\frac{(1+k/m)^{nm}-1}{k/m}\right]$	
4	Present Value of an Annuity. ($PVIFA_{k,n}$)	$PVA = PMT\left[\frac{1-(1+k)^{-n}}{k}\right]$	$PVA = PMT\left[\frac{1-\left(1+k/m\right)^{-nm}}{k/m}\right]$	
5	Present Value of Perpetuity. (PV_p)	$PV_{perpetuity} = \frac{PMT}{k}$	$PV_{perpetuity} = \frac{PMT}{[(1+k)^{1/m}-1]}$	
6	Effective Annual Rate given the APR.	$EAR = APR$	$EAR = (1+k/m)^{m} - 1$	$EAR = e^{k} - 1$
7	The length of time required for a PV to grow to a FV.	$n = \frac{\ln(FV/PV)}{\ln(1+k)}$	$n = \frac{\ln(FV/PV)}{m * \ln(1+k/m)}$	$n = \frac{\ln(FV/PV)}{k}$
8	The APR required for a PV to grow to a FV.	$k = \left(\frac{FV}{PV}\right)^{1/n} - 1$	$k = m * \left[\left(\frac{FV}{PV}\right)^{1/(nm)} - 1\right]$	$k = \frac{\ln(FV/PV)}{n}$
9	Present Value of a Growing Annuity.	$PV = \frac{CF_0(1+g)}{(k-g)}\left[1-\left(\frac{1+g}{1+k}\right)^{n}\right]$		
10	The length of time required for a series of PMT's to grow to a future amount (FVA_n).	$n = \frac{\ln\left[\frac{(FVA)(k)}{PMT}+1\right]}{\ln(1+k)}$	$n = \frac{\ln\left[\left(\frac{k}{m}\right)\left(\frac{FVA}{PMT}+\frac{m}{k}\right)\right]}{m * [\ln(1+k/m)]}$	
11	The length of time required for a series of PMT's to exhaust a specific present amount (PVA_n).	$n = -\frac{\ln\left[1-\frac{(PVA)(k)}{PMT}\right]}{\ln(1+k)}$, for $PVA(k) < PMT$	$n = -\frac{\ln\left[1-\frac{(PVA)(k/m)}{PMT}\right]}{m * [\ln(1+k/m)]}$, for $PVA(k/m) < PMT$	

Legend

k = 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 ≈ 2.71828
PMT = the periodic payment or cash flow	*Perpetuity* = an infinite annuity

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