Time Value of Money				
#	**TVM Formula For:**	**Annual Compounding**	**Compounded (m) Times per Year**	**Continuous Compounding**
1	**Future Value of a Lump Sum. ($FVIF_{r,n}$)**	$FV = PV(1+r)^{n}$	$FV = PV\left(1+\frac{r}{m}\right)^{n*m}$	$FV = PV(e)^{r*n}$
2	**Present Value of a Lump Sum. ($PVIF_{r,n}$)**	$PV = FV(1+r)^{-n}$	$PV = FV(1+k/m)^{-nm}$	$PV = FV(e)^{-r*n}$
3	**Future Value of an Ordinary Annuity. ($FVIFA_{r,n}$)**	$FVA = PMT\left[\frac{(1+r)^{n}-1}{r}\right]$	$FVA = PMT\left[\frac{\left(1+r/m\right)^{n*m}-1}{r/m}\right]$	
4	**Future Value of an Annuity Due. ($FVIFA_{r,n}$)**	$FVA = PMT\left[\frac{(1+r)^{n}-1}{r}\right](1+r$	$FVA = PMT\left[\frac{\left(1+r/m\right)^{n*m}-1}{r/m}\right]\left(1+r/m\right)^{m}$	
5	**Present Value of an Annuity. ($PVIFA_{r,n}$)**	$PVA = PMT\left[\frac{1-(1+r)^{-n}}{r}\right]$	$PVA = PMT\left[\frac{1-\left(1+r/m\right)^{-n*m}}{r/m}\right]\left(1+r/m\right)^{m}$	
6	**Present Value of an Annuity Due. ($PVIFA_{r,n}$)**	$PVA = PMT\left[\frac{1-(1+r)^{-n}}{r}\right](1+r$	$PVA = PMT\left[\frac{1-\left(1+r/m\right)^{-n*m}}{r/m}\right]$	
7	**Present Value of Perpetuity. (PV_p)**	$PVperpetuity = \frac{PMT}{r}$	$PVperpetuity = \frac{PMT}{[(1+r)^{1/m}-1]}$	
8	**Effective Annual Rate given the APR.**	EAR = APR	$EAR = \left(1+\frac{r_{nominal}}{m}\right)^{m} - 1$	$EAR = e^{r} - 1$
9	**The length of time required for a PV to grow to a FV. (Lump Sum)**	$n = \frac{\ln(FV/PV)}{\ln(1+r)}$	$n = \frac{\ln(FV/PV)}{m * \ln\left(1+r/m\right)}$	$n = \frac{\ln(FV/PV)}{r}$
10	**The APR required for a PV to grow to a FV. (Lump Sum)**	$r = \left(\frac{FV}{PV}\right)^{1/n} - 1$	$r = m * \left[\left(\frac{FV}{PV}\right)^{1/(n*m)} - 1\right]$	$r = \frac{\ln(FV/PV)}{n}$
11	**Present Value of a Growing Annuity.**	$PV = \frac{CF_0(1+g)}{(r-g)}\left[1-\left(\frac{1+g}{1+r}\right)^{n}\right]$		
12	**The length of time required for a series of PMT's to grow to a future amount (FVA_n). (Ordinary Annuity)**	$n = \frac{\ln\left[\frac{(FVA)(r)}{PMT}+1\right]}{\ln(1+r)}$	$n = \frac{\ln\left[\left(\frac{r}{m}\right)\left(\frac{FVA}{PMT}+\frac{m}{r}\right)\right]}{m * [\ln(1+r/m)]}$	
13	**The length of time required for a series of PMT's to exhaust a specific present amount (PVA_n). (Ordinary**	$n = -\frac{\ln\left[1-\frac{(PVA)(r)}{PMT}\right]}{\ln(1+r)}$,	$n = -\frac{\ln\left[1-\frac{(PVA)(r/m)}{PMT}\right]}{m * [\ln(1+r/m)]}$,	

	Annuity)	for PVA(r) < PMT	for PVA(r/m) < PMT	

Bond Valuation			
#	Formula For:	Annual	Semiannual Payments
1	Interest	$INT = CR * m$	$INT = \frac{CR}{2} * m$
2	Bond Valuation	$V_B = INT\left(\frac{1-(1+r_d)^{-n}}{r_d}\right) + \frac{M}{(1+r_d)^n}$	$V_B = \frac{INT}{2}\left(\frac{1-\left(1+\frac{r_d}{2}\right)^{-2n}}{\frac{r_d}{2}}\right) + \frac{M}{\left(1+\frac{r_d}{2}\right)^{2n}}$
3	Determining Coupon Rate	$V_B = INT\left(\frac{1-(1+r_d)^{-n}}{r_d}\right) + \frac{M}{(1+r_d)^n}$ $INT = CR * M$	$V_B = \frac{INT}{2}\left(\frac{1-\left(1+\frac{r_d}{2}\right)^{-2n}}{\frac{r_d}{2}}\right) + \frac{M}{\left(1+\frac{r_d}{2}\right)^{2n}}$ $INT = CR * M$
4	Yield to Maturity	$YTM = \frac{INT + \left(\frac{M - V_B}{n}\right)}{\left(\frac{M + 2V_B}{3}\right)}$	$YTM = \frac{INT + \left(\frac{M - V_B}{2n}\right)}{\left(\frac{M + 2V_B}{3}\right)}$ $YTM = YTM * 2$
5	Yield to Call	$YTM = \frac{INT + \left(\frac{Call\,Price - V_B}{n}\right)}{\left(\frac{Call\,Price + 2V_B}{3}\right)}$	$YTM = \frac{INT + \left(\frac{Call\,Price - V_B}{2n}\right)}{\left(\frac{Call\,Price + 2V_B}{3}\right)}$ $YTM = YTM * 2$
6	Current Yield	$\frac{INT_\$}{Current\,Price}$	

Stock Valuation		
#	Formula For:	
1	Preferred Stock	$V_{ps} = \frac{\text{preferred dividend}}{\text{required rate of return}} = \frac{D_{ps}}{r_{ps}}$
2	Common Stock (Zero Growth)	$P_0 = \frac{D}{r_s}$
3	Common Stock (Constant Growth)	$P_0 = \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}$
4	Dividends	$D_1 = D_0(1+g)$ *or* $D_2 = D_0(1+g)^2 = D_1(1+g)$ *or* $D_3 = D_0(1+g)^3 = D_1(1+g)^2 = D_2(1+g)$
5	Common Stock (Constant Growth for a given # of years)	$P_0 = \frac{D_1}{r_s - g}\left[1 - \left(\frac{1+g}{1+r_s}\right)^n\right]$
6	Required Rate of Return	$r_s = \frac{Div_1}{P_0} + g$

Risk and Return			
	Formula For:	**Single Security**	**Portfolio**
1	**Expected Return**	$\hat{r} = \sum_{i=1}^{n} P_i r_i$	$\hat{r}_p = \sum_{i=1}^{N} W_i \hat{r}_i$ $\hat{r}_p = W_1 \hat{r}_1 + W_2 \hat{r}_2 + \ldots + W_N \hat{r}_N$ or $SML = r_s = r_{RF} + (r_M - r_{RF}) b_i$
2	**Variance**	$\sigma_i^2 = \sum_{j=1}^{m} P_{ij} (r_{ij} - \hat{r}_i)^2$	$\sigma_P^2 = W_1^2 \sigma_1^2 + W_2^2 \sigma_2^2 + 2 W_1 W_2 \sigma_{12}$ covariance $\sigma_P^2 = W_1^2 \sigma_1^2 + W_2^2 \sigma_2^2 + 2 W_1 W_2 \sigma_1 \sigma_2 \rho_{12}$ correlation
3	**Std. Deviation**	$\sigma = \sqrt{\sigma_i^2}$	$\sigma = \sqrt{\sigma_P^2}$
4	**Coefficient of Variation**	$CV = \frac{\sigma}{\hat{r}}$	
5	**Covariance**	$\sigma_{12} = \sum_{j=1}^{M} P_i (r_{1j} - \hat{r}_1)(r_{2j} - \hat{r}_2)$	
6	**Correlation**	$\rho_{12} = \frac{\sigma_{1,2}}{\sigma_1 * \sigma_2}$	
7	**Beta**	$b = \frac{\sigma_{1m}}{\sigma_m^2}$	$b_p = W_1 b_1 + W_2 b_2 + \ldots + W_n b_n$

Capital Budgeting		
	Formula For:	
1	**Net Present Value (NPV)**	$NPV = -CF_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t}$
2	**Internal Rate of Return (IRR)**	$-CF_0 + \sum_{t=1}^{n} \frac{CF_t}{(1+IRR)^t} = 0$ or $IRR = \frac{Cash\ Flow}{Cost}$
3	**Modified Internal Rate of Return (MIRR)**	$MIRR = \left(\frac{TV}{PV\ Cost}\right)^{(1/n)} - 1$
4	**Payback Period**	$\text{Payback period} = \frac{\text{net cash flows}}{\text{annual net cash inflow}}$ or $\text{Payback period} = \text{year before full recovery} + \frac{\text{uncovered cost at start of year}}{\text{cash flow during year}}$
5	**Equivalent Annual Annuity (EAA)**	$EAA = \frac{NPV}{\left(\frac{1-(1+r)^{-n}}{r}\right)}$

Cost of Capital

	Formula For:	Without Flotation Cost	With Flotation Cost
1	**Cost of Debt (rd)**	$r_d = \text{YTM} = \dfrac{INT + \left(\dfrac{M - Vb}{N}\right)}{\left(\dfrac{M + 2V_B}{3}\right)}$	
2	**Cost of Preferred Equity (rp)**	$r_p = \dfrac{D_p}{P_n}$	$r_p = \dfrac{D_p}{P_n(1-F)}$ if F in % or $r_p = \dfrac{D_p}{P_n - F_\$}$ if F in \$
3	**Cost of Retained Earnings (rs)**	**CAPM Approach -** $r_s = r_{RF} + (r_M - r_{RF})b_i$ **Discounted Cash Flow Approach (DCF)** $r_S = \dfrac{D1}{P0} + g$ **Bond Yield + Risk Premium Approach** Bond Yield + Risk Premium	
4	**Cost of Newly Issued Common Stock (re)**		$r_e = \dfrac{D_1}{P_0(1-F)} + g$
5	**Weighted Average Cost of Capital (WACC)**	$\text{WACC} = W_d r_d (1-T) + W_p r_p + W_s r_s$	

Legend

r **= the nominal rate, component cost of capital, discount rate, Annual Percentage Rate (APR)**	***PMT*** **= the periodic payment or cash flow**
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**	***n*** **= the number of periods**
CR = coupon rate, %	***M = maturity value, par value***
INT = Interest, \$	***Vb = Value of the bond***
P_0 **=Price today**	r_d **= cost of debt, rate of return required by bondholders**
r_S **=required rate of return by stockholders**	**D = dividend**
F = Flotation Cost	**g = growth rate**
b=beta	P_i **= probability**
ρ_{12} **=correlation**	$\sigma_{1,2}$ **= covariance**
$\hat{r}$ **= expected return**	σ_i^2 **= variance and** σ_i **= standard deviation**
TV = Terminal Value, FV of all cash inflows	**W = proportion invested**