FIN 101 FORMULAS

TIME VALUE OF MONEY

Future value: the value to which a single amount (PV) will grow after n years with compound interest at an annual interest rate of k percent is *(p. 230)*

$FV_n = PV(1+i)^n$ *which also equals* $PV(FVIF_{i,n})$ $\quad FVIF_{i,n} = (1+i)^n$

Present value: the value today of a single amount (FV_n) to be received in n years is *(p. 235)*

$$PV = \frac{FV_n}{(1+i)^n} \quad \text{(which also equals } FV_n * PVIF_{i,n}) \quad PVIF_{i,n} = \frac{1}{(1+i)^n}$$

Perpetuity: the present value of a perpetual stream of cash flows of PMT per year is *(p. 250)*

$$PVP = \frac{Payment}{Interest\ rate} = \frac{PMT}{i}$$

Present Value Interest Factor for an Annuity of n payments at i interest ($PVIFA_{i,n}$): *(p. 246)*

$$PVIFA_{i,n} = \sum_{t=1}^{n} \frac{1}{(1+i)^t} = \left[\frac{1 - \frac{1}{(1+i)^n}}{i}\right]$$

Future Value Interest Factor for an Annuity of n payments at i interest ($FVIFA_{i,n}$): *(p. 242)*

$$FVIFA_{i,n} = \sum_{t=1}^{n} (1+i)^{n-t} = \frac{(1+i)^n - 1}{i}$$

(Ordinary) Annuity: the present value of a stream of PMT per year for n years is *(p. 245)*

$$PVA_n = PMT\left[\frac{1}{(1+i)^1}\right] + PMT\left[\frac{1}{(1+i)^2}\right] + \ldots + PMT\left[\frac{1}{(1+i)^n}\right]$$

$$PVA_n = PMT\left[\sum_{t=1}^{n} \frac{1}{(1+i)^t}\right] \quad OR \quad PVA_n = PMT * PVIFA_{i,n}$$

(Ordinary) Annuity: the future value of a stream of PMT per year for n years is *(p. 241-2)*

$$FVA_n = PMT(1+i)^0 + PMT(1+i)^1 + PMT(1+i)^2 + \ldots + PMT(1+i)^{n-1}$$

$$FVA_n = PMT\left[\frac{(1+i)^n - 1}{i}\right] \quad OR \quad FVA_n = PMT * FVA_{i,n}$$

Annuity Due: *(p. 247 & 243)*

$$PVA(DUE)_n = PMT * \left[\frac{1 - \frac{1}{(1+i)^n}}{i}\right] * [1+i] \quad OR \quad = PMT * [PVIFA_{i,n} * (1+i)]$$

$$FVA(DUE)_n = PMT * \left[\frac{(1+i)^n - 1}{i}\right] * [1+i] \quad OR \quad = PMT * [FVIFA_{i,n} * (1+i)]$$

Effective Annual Rate (EAR): the effective annual rate on a loan given a *simple* rate and m compounding periods per year: *(p. 256)*

$$EAR = \left(1 + \frac{i_{simple}}{m}\right)^m - 1$$

PV with more frequent discounting:

$$PV = \frac{FV_n}{\left[1 + \frac{i_{simple}}{m}\right]^{n \cdot m}}$$

PV with continuous discounting: *(p. 281)*

$$PV = FV_n\, e^{-in}$$

FV with more frequent compounding: *(p.257)*

$$FV_n = \left[1 + \frac{i_{simple}}{m}\right]^{n \cdot m} (PV)$$

APR = *(the periodic rate) * (number of periods per year)*

STOCK AND BOND VALUATION

Value of a Bond *(p. 287)*:

$$V_d = \sum_{t=1}^{n} \frac{INT}{(1+k_d)^t} + \frac{M}{(1+k_d)^N} \quad OR \quad V_d = INT(PVIFA_{k_d,N}) + M(PVIF_{k_d,N})$$

Approximation of a Bond's YTM *(p. 293)*:

$$YTM \approx \frac{INT + \frac{(M - V_d)}{N}}{\left[\frac{(M + 2V_d)}{3}\right]}$$

Value of Common Stock *(p. 302)*:

$$V_0 = \hat{P}_0 = \sum_{t=1}^{\infty} \frac{\hat{D}_t}{(1+k_s)^t}$$

Value of nongrowing stock or preferred stock *(p. 303)*:

$$\hat{P}_0 = \frac{D}{k_s} = \frac{D_{ps}}{k_s}$$

Value of constant-growth common stock *(p. 308)*:

$$\hat{P}_0 = \frac{\hat{D}_1}{(k_s - g)} \quad OR \quad k_s = \frac{\hat{D}_1}{\hat{P}_0} + g$$

RISK AND RETURN

Measures of risk and return:

Mean or expected return = probability-weighted average of possible outcomes

(p. 184)

OR, Expected Return = $\hat{k} = \sum_{i=1}^{n} Pr_i k_i$

Variance = σ^2 = mean of squared deviations around the mean

OR, $\sigma^2 = \sum_{i=1}^{n} (k_i - \hat{k})^2 Pr_i$

(p. 188)

Standard deviation = σ = $\sqrt{VARIANCE}$

OR, $\sigma = \sqrt{\sigma^2} = \sqrt{\sum_{i=1}^{n} (k_i - \hat{k})^2\, Pr_i}$

Expected Return on a Portfolio *(p.193)* = $\hat{k}_p = w_1\hat{k}_1 + w_2\hat{k}_2 + \ldots + w_N\hat{k}_N$

Variance of the Returns of a Two Security Portfolio:

$$\sigma_p^2 = (w_1^2)(\sigma_1^2) + (w_2^2)(\sigma_2^2) + 2(w_1 w_2)(\sigma_1\sigma_2)(Corr_{1,2})$$

Standard Deviation of the Returns of a Two Security Portfolio:

$$\sigma_p = \sqrt{\sigma_p^2}$$