EQUATION SHEET
Principles of Finance
Exam 2

Valuation Concepts

General valuation model:

$$V_0 = \text{PV of CF} = \frac{\hat{CF}_1}{(1+r)^1} + \ldots + \frac{\hat{CF}_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{\hat{CF}_t}{(1+r)^t}$$

Bond Valuation:

$$V_d = \frac{INT}{(1+r_d)^1} + \ldots + \frac{INT}{(1+r_d)^N} + \frac{M}{(1+r_d)^N} = INT\left[\frac{1 - \frac{1}{(1+r_d)^N}}{r_d}\right] + M\left[\frac{1}{(1+r_d)^N}\right]$$

$$V_d = \frac{INT}{(1+YTM)^1} + \ldots + \frac{INT}{(1+YTM)^N} + \frac{M}{(1+YTM)^N}$$

YTM = Yield to maturity

$$V_d = \frac{INT}{(1+YTC)^1} + \ldots + \frac{INT}{(1+YTC)^N} + \frac{M}{(1+YTC)^N}$$

YTC = Yield to call

$$\text{Approximate yield to maturity} = \frac{INT + \left[\frac{M - V_d}{N}\right]}{\left[\frac{2(V_d) + M}{3}\right]}$$

To approximate YTC, substitute the call price for M and the time to call for N

$$YTM = \text{Bond yield} = \text{Current yield} + \text{Capital gains yield} = \left[\frac{INT}{V_{d0}}\right] + \left[\frac{V_{d1} - V_{d0}}{V_{d0}}\right]$$

Stock Valuation:

$$V_s = P_0 = \frac{\hat{D}_1}{(1+r_s)^1} + \ldots + \frac{\hat{D}_\infty}{(1+r_s)^\infty} = \sum_{t=1}^{\infty} \frac{\hat{D}_t}{(1+r_s)^t}$$

$$\text{Constant growth stock:} = P_0 = \frac{D_0(1+g)}{r_s - g} = \frac{\hat{D}_1}{r_s - g}$$

$$\text{Nonconstant growth stock:} = P_0 = \frac{\hat{D}_1}{(1+r_s)^1} + \ldots + \frac{\hat{D}_n + \hat{P}_n}{(1+r_s)^n} \quad \text{where } \hat{P}_n = \frac{\hat{D}_n(1+g_{norm})}{r_s - g_{norm}} = \frac{\hat{D}_{n+1}}{r_s - g_{norm}}$$

g_{norm} = normal, or constant growth

$$r_s = \text{Stock yield} = \left(\text{Dividend yield}\right) + \left(\text{Capital gains yield}\right) = \left(\frac{\hat{D}_1}{P_0}\right) + \left(\frac{\hat{P}_1 - P_0}{P_0}\right)$$

Risk and Rates of Return

$$\text{Expected rate of return} = \hat{r} = Pr_1 r_1 + Pr_2 r_2 + \ldots + Pr_n r_n = \sum_{i=1}^{n} Pr_i r_i$$

$$\text{Variance} = \sigma^2 = \sum_{i=1}^{n} (r_i - \hat{r})^2 Pr_i r_i$$

$$\text{Standard deviation} = \sigma = \sqrt{\sigma^2} = \sqrt{\sum_{i=1}^{n} (r_i - \hat{r})^2 Pr_i}$$

$$\text{Coefficient of variation} = CV = \frac{\text{Risk}}{\text{Return}} = \frac{\sigma}{\hat{r}}$$

$$\hat{r}_P = w_1\hat{r}_1 + w_2\hat{r}_2 + \ldots + w_N\hat{r}_N = \sum_{j=1}^{N} w_j\hat{r}_j$$

$$\beta_P = w_1\beta_1 + w_2\beta_2 + \ldots + w_N\beta_N = \sum_{j=1}^{N} w_j\beta_j$$

Return = Risk-free return + Risk Premium = r_{RF} + RP

$$RP = \text{Return} - r_{RF}$$

$$RP_{Investment} = RP_M \times \beta_{Investment}$$

$$\begin{aligned} r_{Investment} &= r_{RF} + RP_{Investment} \\ &= r_{RF} + (RP_M)\beta_{Investment} \\ &= r_{RF} + (r_M - r_{RF})\beta_{Investment} \end{aligned}$$

Capital Budgeting

Evaluation techniques:

$$\text{Payback} = \left(\begin{array}{c}\text{Number of years before} \\ \text{full recovery of} \\ \text{original investment}\end{array}\right) + \left(\frac{\begin{array}{c}\text{Unrecovered cost at start} \\ \text{of full-recovery year}\end{array}}{\begin{array}{c}\text{Total cash flow during} \\ \text{full-recovery year}\end{array}}\right)$$

Tradtional payback—unadjusted cash flows are used
Discounted payback—discounted cash flows, or present values, are used

$$NPV = CF_0 + \frac{\hat{CF}_1}{(1+r)^1} + \ldots + \frac{\hat{CF}_2}{(1+r)^n} = \sum_{t=0}^{n} \frac{\hat{CF}_2}{(1+r)^t}$$

$$CF_0 + \frac{\hat{CF}_1}{(1+IRR)^1} + \frac{\hat{CF}_2}{(1+IRR)^2} + \ldots + \frac{\hat{CF}_n}{(1+IRR)^n} = CF_0 + \sum_{t=1}^{n} \frac{\hat{CF}_t}{(1+IRR)^t} = 0$$

IRR = internal rate of return

$$\text{MIRR: PV of cash outflow} = \frac{TV}{(1+MIRR)^n}$$

$$\sum_{t=0}^{n} \frac{COF_t}{(1+r)^t} = \frac{\sum_{t=0}^{n} CIF_t (1+r)^{n-t}}{(1+MIRR)^n}$$

Cash Flow Estimation

$$\begin{aligned} \begin{array}{c}\text{Incremental} \\ \text{operating cash flow}_t\end{array} &= \Delta\text{Cash revenues}_t - \Delta\text{Cash expenses}_t - \Delta\text{Taxes}_t \\ &= (\Delta\text{Cash revenues}_t - \Delta\text{Cash expenses}_t)(1-T) + \Delta\text{Depreciation}_t(T) \\ &= \Delta NI_t + \Delta\text{Depreciation}_t = \Delta EBT_t(1-T) + \Delta\text{Depreciation}_t \end{aligned}$$