EQUATION SHEET
Principles of Finance
Exam 2

COST OF MONEY

Dollar return = (Dollar income) + (Capital gains)
= (Dollar income) + (Ending value – Beginning value)

$$\text{Yield} = \frac{\text{Dollar return}}{\text{Beginning value}} = \frac{\text{Dollar income} + \text{Capital gains}}{\text{Beginning value}}$$

$$= \frac{\text{Dollar income} + (\text{Ending value - Beginning value})}{\text{Beginning value}}$$

Rate of return = r = Risk-free rate + Risk premium = r = r_{RF} + RP

Rate of return = r = r_{RF} + RP = r_{RF} + [DRP + LP + MRP]
= [r* + IP] + [DRP + LP + MRP]

$r_{Treasury}$ = r_{RF} + MRP = [r* + IP] + MRP

$$\text{Yield on an n-year bond} = \frac{\begin{pmatrix}\text{Interest rate}\\ \text{in Year 1}\end{pmatrix} + \begin{pmatrix}\text{Interest rate}\\ \text{in Year 2}\end{pmatrix} + \cdots + \begin{pmatrix}\text{Interest rate}\\ \text{in Year n}\end{pmatrix}}{n} = \frac{R_1 + R_2 + \cdots + R_n}{n}$$

$$\text{Value of an asset} = \frac{\hat{CF}_1}{(1+r)^1} + \frac{\hat{CF}_2}{(1+r)^2} + \cdots + \frac{\hat{CF}_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{\hat{CF}_t}{(1+r)^t}$$

Valuation Concepts

General valuation model:

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

Bond Valuation:

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

Adjust r_d, N, and INT if interest is paid more than once per year.

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

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

$$r_d = YTM = \text{Bond yield} = \begin{matrix}\text{Current}\\ \text{yield}\end{matrix} + \begin{matrix}\text{Capital gains}\\ \text{yield}\end{matrix} = \frac{INT}{V_{d0}} + \frac{V_{d1} - V_{d0}}{V_{d0}}$$

Stock Valuation:

$$\text{Stock value} = V_s = \hat{P}_0 = \frac{\hat{D}_1}{(1+r_s)^1} + \cdots + \frac{\hat{D}_\infty}{(1+r_s)^\infty} = \sum_{t=1}^{\infty} \frac{\hat{D}_t}{(1+r_s)^t}$$

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

Nonconstant growth stock: $P_0 = \dfrac{\hat{D}_1}{(1+r_s)^1} + \dfrac{\hat{D}_2}{(1+r_s)^2} + \cdots + \dfrac{\hat{D}_n + \hat{P}_n}{(1+r_s)^n}$; where $\hat{P}_n = \dfrac{\hat{D}_n(1+g_{norm})}{r_s - g_{norm}}$

g_{norm} = normal, or constant growth

$$\hat{r}_s = \text{Stock yield} = \left(\begin{matrix}\text{Dividend}\\ \text{yield}\end{matrix}\right) + \left(\begin{matrix}\text{Capital gains}\\ \text{yield}\end{matrix}\right) = \frac{\hat{D}_1}{P_0} + g = \left(\frac{\hat{D}_1}{P_0}\right) + \left(\frac{\hat{P}_1 - P_0}{P_0}\right)$$

$$\begin{matrix}\text{Economic}\\ \text{value added}\end{matrix} = EVA = EBIT(1-T) - \left[\left(\begin{matrix}\text{Average cost}\\ \text{of funds}\end{matrix}\right) \times \left(\begin{matrix}\text{Invested}\\ \text{capital}\end{matrix}\right)\right]$$

Risk and Rates of Return

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

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

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

$$\text{Estimated } \sigma = s = \sqrt{\frac{\sum_{t=1}^{n} (\ddot{r}_t - \bar{r})^2}{n-1}} \qquad \bar{r} = \frac{\ddot{r}_1 + \ddot{r}_2 + \cdots + \ddot{r}_n}{n} = \frac{\sum_{t=1}^{n} \ddot{r}_t}{n}$$

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

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

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

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

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

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

$r_{Investment} = r_{RF} + RP_{Investment}$

$= r_{RF} + (RP_M)\beta_{Investment}$

$= r_{RF} + (r_M - r_{RF})\beta_{Investment}$

Capital asset pricing model (CAPM)