The University of Hong Kong
MS 19-601-15/93: Finance

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Assignment #2 Solution

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1. (8 points) Suppose the risk-free rate is 6 percent and the expected return on the market is 12 percent.

   a. If a stock has a beta of 0.7, what is its required return based on CAPM?

   Use the SML equation $r_i = r_{\text{RF}} + \beta_i(r_{\text{M}} - r_{\text{RF}})$

   $$r = 6\% + 0.7(12\% - 6\%) = 6\% + 4.2\% = 10.2\%$$

   b. If another stock has an expected return of 18 percent, what must its beta be?

   $$\begin{aligned} 18\% &= 6\% + \beta(12\% - 6\%) \\ \beta &= \frac{12\%}{6\%} = 2.0 \end{aligned}$$

2. (10 points) An investor has \$15,000 invested in a stock which has an estimated beta of 1.2 and another \$5,000 invested in the stock of the company for which she works. The risk-free rate is 6 percent and the market risk premium is 8 percent. The investor calculates that the required rate of return on her portfolio (total \$20,000) is 15 percent. What is the beta of the company for which she works, β_c?

   First find the portfolio's beta using the SML:

   $$\begin{aligned} 15\% &= 6\% + (8\%)\beta_p \\ 9\% &= 8\%\beta_p \\ \beta_p &= 1.125. \end{aligned}$$

   Let β_c be the beta of the company for which she works. The portfolio's beta is a weighted average of the individual betas of the stocks in the portfolio. Therefore,

   $$\begin{aligned} 1.125 &= (\$15,000/\$20,000)1.2 + (\$5,000/\$20,000)\beta_c \\ 1.125 &= 0.9 + 0.25\beta_c \\ 0.225 &= 0.25\beta_c \\ \beta_c &= 0.9. \end{aligned}$$

3. (10 points) Consider a portfolio that consists of the following assets.

Stock	Investment	Beta
A	\$200,000	1.50
B	\$300,000	-0.50
C	\$500,000	1.25
D	\$1,000,000	0.75

The market required rate of return is 15 percent and the risk-free rate is 7 percent.

a. Find the β of this stock portfolio.

$$\begin{aligned}\beta_p &= \frac{200K}{2,000K}(1.5) + \frac{300K}{2,000K}(-0.5) + \frac{500K}{2,000K}(1.25) + \frac{1,000K}{2,000K}(0.75) \\ &= 0.15 + (-0.075) + 0.3125 + 0.375 = 0.7625\end{aligned}$$

b. What is the required rate of return of this portfolio?

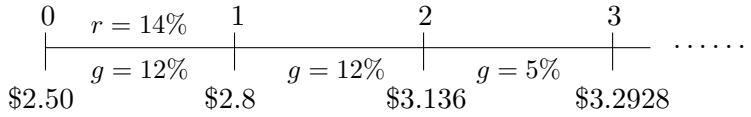
$$r_p = 7\% + (0.7625)(15\% - 7\%) = 7\% + 6.1\% = 13.1\%$$

4. (8 points) A share of common stock has just paid a dividend of \$3.00. Suppose the expected long-run dividend growth rate is 5 percent and the required return of the stock is 12 percent. What is the current price of the stock?

$$P_0 = \frac{3(1+0.05)}{0.12 - 0.05} = \$45.0.$$

5. (12 points) The last dividend paid by Company A was \$2.50. Its growth rate is expected to be 12 percent for two years, after which dividends are expected to grow at a rate of 5 percent forever. The company's stockholders require a rate of return on equity (r_s) of 14 percent.

a. Draw a clear and accurate time line.



b. Find the current price of the stock P_0.

Since this is a non-constant growth stock, the formula for constant growth stock does not apply. But this is a two-stage growth model because the growth rate is constant after the second year ($t = 2$). First compute $\hat{P}_2$, the expected price at $t = 2$.

$$\hat{P}_2 = \frac{D_3}{r - g} = \frac{3.2928}{0.14 - 0.05} = 36.5867$$

To find the current price of the stock, discount $\hat{P}_1$ and D_1 back to the current period $t = 0$.

$$P_0 = \frac{2.8}{1 + 0.14} + \frac{\$3.136 + \$36.5867}{(1 + 0.14)^2} = \$2.456 + \$30.5653 = \$33.0213.$$

6. (12 points) Newark Co. Ltd. just paid a dividend of \$3.6 per share on its stocks. The growth rate in dividends is expected to be 5% per year indefinitely.

   a. If the stock currently sells for \$45.75 per share, what is its required rate of return?

      Given $D_0 = 3.6$ and $g = 5\%$, $D_1 = 3.6(1.05) = 3.78$.

$$\begin{aligned} P_0 &= \frac{D_1}{r-g} \\ r &= \frac{D_1}{P_0} + g \\ &= \frac{3.78}{45.75} + 0.05 \\ &= 13.26\% \end{aligned}$$

   b. What is the stock's dividend yield?

$$\frac{D_1}{P_0} = \frac{3.78}{45.75} = 8.26\%$$

   c. Find P_1 and use it to verify that the expected capital gains yield is equal to the long-term growth rate.

      For a constant growth stock, Capital Gains Yield $= g = 5\%$. We can verify this by first finding $\hat{P}_1$

$$\begin{aligned} \hat{P}_1 &= \frac{D_2}{r-g} = \frac{D_1(1+g)}{r-g} \\ &= \frac{3.78(1.05)}{0.1326 - 0.05} \\ &= \frac{3.969}{0.0826} \\ &= 48.05 \end{aligned}$$

      Capital Gains Yield:

$$\begin{aligned} \text{CGY} &= \frac{\hat{P}_1 - P_0}{P_0} \\ &= \frac{48.05 - 45.75}{45.75} \approx 0.05 \end{aligned}$$