

LSE Summer School
FM250 – Finance

Classwork 2: CAPM
Answer key

Question 1

(a) Market risk premium = $r_m - r_f = 0.12 - 0.04 = 0.08 = 8.0\%$

(b) Use the security market line:

$$r = r_f + \beta(r_m - r_f)$$

$$r = 0.04 + [1.5 \times (0.12 - 0.04)] = 0.16 = 16.0\%$$

(c) For any investment, we can find the opportunity cost of capital using the security market line. With $\beta = 0.8$, the opportunity cost of capital is:

$$r = r_f + \beta(r_m - r_f)$$

$$r = 0.04 + [0.8 \times (0.12 - 0.04)] = 0.104 = 10.4\%$$

The opportunity cost of capital is 10.4% and the investment is expected to earn 9.8%. Therefore, the investment has a negative NPV.

(d) Again, we use the security market line:

$$r = r_f + \beta(r_m - r_f)$$

$$0.112 = 0.04 + \beta(0.12 - 0.04) \Rightarrow \beta = 0.9$$

Question 2

The appropriate discount rate for the project is:

$$r_f + \beta[E(r_M) - r_f] = 8 + [1.8 \times (16 - 8)] = 22.4\%$$

Using this discount rate:

$$NPV = -\$40 + \sum_{t=1}^{10} \frac{\$15}{1.224^t} = -\$40 + [\$15 \times \text{Annuity factor (22.4\%, 10 years)}] = \$18.09$$

[Note: The internal rate of return (IRR) for the project is 35.73%. Recall that NPV is positive if $IRR > \text{discount rate}$]

Question 3

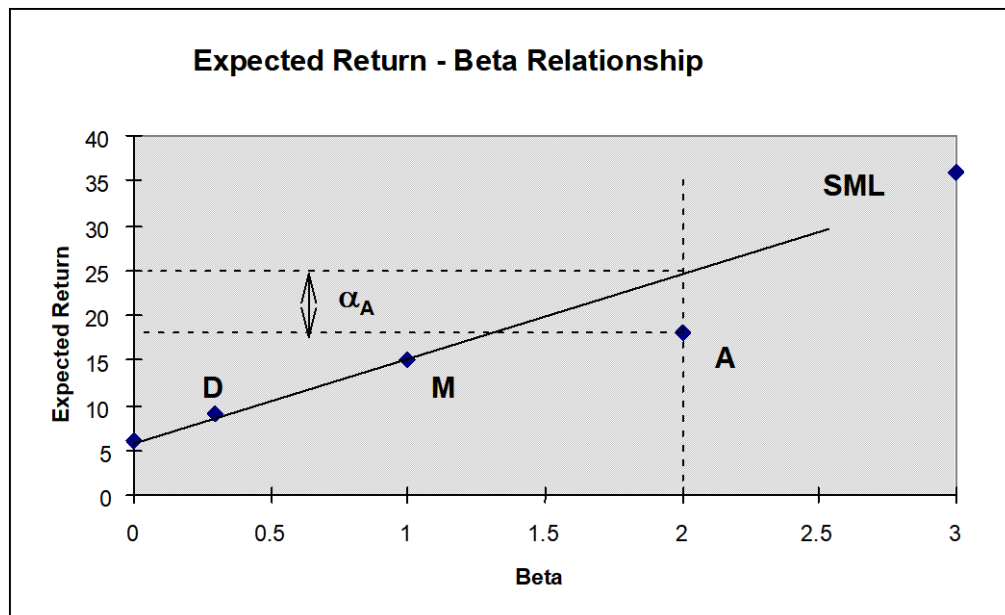
(a) With the two scenarios equally likely, the expected return is an average of the two possible outcomes:

$$E(r_A) = 0.5 \times (-2 + 38) = 18\%$$

$$E(r_D) = 0.5 \times (6 + 12) = 9\%$$

(b) The SML is determined by the market expected return of $[0.5(25 + 5)] = 15\%$,

with a beta of 1, and the T-bill return of 6% with a beta of zero. See the following graph.



The equation for the security market line is:

$$E(r) = 6 + \beta(15 - 6)$$

(c) Based on its risk, stock A has a required expected return of:

$$E(r_A) = 6 + 2.0(15 - 6) = 24\%$$

The analyst's forecast of expected return is only 18%. Thus the stock's alpha is:

$$\alpha_A = \text{actually expected return} - \text{required return (given risk)} = 18\% - 24\% = -6\%$$

Similarly, the required return for stock D is:

$$E(r_D) = 6 + 0.3(15 - 6) = 8.7\%$$

The analyst's forecast of expected return for D is 9%, and hence, the stock has a positive alpha:

$$\alpha_D = \text{actually expected return} - \text{required return (given risk)} = 9 - 8.7 = +0.3\%$$