FINM3093 Investments
Solution to Test

1-5 (20 points) CBABB

6. (25 points)
   a. Intercept = 7%. Slope = (15 – 7)/22 = 8/22 = 0.36
   b. y = 420,000/300,000 = 1.4, 1 – y = -0.4, reflecting a short (borrowing) position in the risk-free asset. So $E(r_C)$ = 7% + 1.4(8%) = 18.2% and σ_C = 1.4(22%) = 30.8%.
   c. Slope($y \le 1$) = 8/22 = 0.36. Slope(y > 1) = (15 – 9)/22 = 6/22 = 0.27
   d. $y = \frac{E(r_P)-r_f}{A\sigma_P^2} = \frac{.15-.07}{4(.22^2)} = 0.41$. So the investor should invest 41% of the investment budget in the risky portfolio and 59% in the risk-free asset. The expected return and standard deviation of the complete portfolio are $E(r_C)$ = 7% + .41(8%) = 10.28% and σ_C = .41(22%) = 9.02%.
   e. If r_f^B= 7%, this investor would have chosen to invest in the risk portfolio:

$$y = \frac{E(r_P)-r_f}{A\sigma_P^2} = \frac{.15-.07}{1.1(.22^2)} = 1.50$$

   which means that the investor would have borrowed an amount equal to 50% of her own investment capital, placing all the proceeds in the risky portfolio. But at the higher borrowing rate r_f^B= 9%, the investor will choose to borrow less and put less in the risky asset. In this case,

$$y = \frac{E(r_P)-r_f}{A\sigma_P^2} = \frac{.15-.09}{1.1(.22^2)} = 1.13$$

   Thus 13% of her investment capital will be borrowed.

   f. For borrowing rate 7%,

$$y = 1 = \frac{E(r_P)-r_f}{A\sigma_P^2} = \frac{.15-.07}{A(.22^2)}$$

   So A = 1.65. For borrowing rate 9%,

$$y = 1 = \frac{E(r_P)-r_f}{A\sigma_P^2} = \frac{.15-.09}{A(.22^2)}$$

   Then, A = 1.24. Investors with A ≥ 1.65 or A ≤ 1.24 will not be affected by the higher borrowing rate, with the former not borrowing in both cases and the latter borrowing in both cases. Investors with 1.24 < A < 1.65 will be affected by the higher borrowing rate: they will borrow under borrowing rate 7% but will not at borrowing rate 9%.

7. (25 points)

a. (i) $\beta_A = (\rho_{A,M})(\sigma_A) / \sigma_M$

$0.85 = (\rho_{A,M})(0.31) / 0.20$

$\rho_{A,M} = 0.55$

(ii) $\beta_B = (\rho_{B,M})(\sigma_B) / \sigma_M$

$1.40 = (.50)(\sigma_B) / 0.20$

$\sigma_B = 0.56$

(iii) $\beta_C = (\rho_{C,M})(\sigma_C) / \sigma_M$

$\beta_C = (.35)(.65) / 0.20$

$\beta_C = 1.14$

(iv) The market has a correlation of 1 with itself.

(v) The beta of the market is 1.

(vi) The risk-free asset has zero standard deviation.

(vii) The risk-free asset has zero correlation with the market portfolio.

(viii) The beta of the risk-free asset is 0.

b. Using the CAPM to find the expected return of the stock, we find:

Firm A:
$E(r_A) = r_f + \beta_A[E(r_M) - r_f] = 0.05 + 0.85(0.12 - 0.05) = .1095$, or 10.95%

According to the CAPM, the expected return on Firm A's stock should be 10.95%. However, the expected return on Firm A's stock given in the table is only 10%. Therefore, Firm A's stock is overpriced, and you should sell it.

Firm B:

$E(r_B) = r_f + \beta_B[E(r_M) - r_f] = 0.05 + 1.4(0.12 - 0.05) = .1480$, or 14.80%

According to the CAPM, the expected return on Firm B's stock should be 14.80%. However, the expected return on Firm B's stock given in the table is 14%. Therefore, Firm B's stock is overpriced, and you should sell it.

Firm C:
$E(r_C) = r_f + \beta_C[E(r_M) - r_f] = 0.05 + 1.14(0.12 - 0.05) = .1296$, or 12.96%

According to the CAPM, the expected return on Firm C's stock should be 12.96%. However, the expected return on Firm C's stock given in the table is 16%. Therefore, Firm C's stock is underpriced, and you should buy it.

8. (18 points)
Let r_x be the risk premium on investment X, let x_x be the portfolio weight of X (and similarly for Investments Y and Z, respectively).

a. $r_x = (1.75 \times 0.04) + (0.25 \times 0.08) = 0.09 = 9.0\%$

$r_y = [(-1.00) \times 0.04] + (2.00 \times 0.08) = 0.12 = 12.0\%$

$r_z = (2.00 \times 0.04) + (1.00 \times 0.08) = 0.16 = 16.0\%$

b. This portfolio has the following portfolio weights:

$x_x = 200/(200 + 50 - 150) = 2.0$

$x_y = 50/(200 + 50 - 150) = 0.5$

$x_z = -150/(200 + 50 - 150) = -1.5$

The portfolio's betas to the factors are:

Factor 1: $(2.0 \times 1.75) + [0.5 \times (-1.00)] - (1.5 \times 2.00) = 0$

Factor 2: $(2.0 \times 0.25) + (0.5 \times 2.00) - (1.5 \times 1.00) = 0$

Because the betas are both zero, the expected risk premium is zero.

c. This portfolio has the following portfolio weights:

$x_x = 80/(80 + 60 - 40) = 0.8$

$x_y = 60/(80 + 60 - 40) = 0.6$

$x_z = -40/(80 + 60 - 40) = -0.4$

The betas of this portfolio to the factors are:

Factor 1: $(0.8 \times 1.75) + [0.6 \times (-1.00)] - (0.4 \times 2.00) = 0$

Factor 2: $(0.8 \times 0.25) + (0.6 \times 2.00) - (0.4 \times 1.00) = 1.0$

The expected risk premium for this portfolio is equal to the expected risk premium for the second factor, or 8%.

d. The sensitivity requirement can be expressed as:

Factor 1: $(x_x)(1.75) + (x_y)(–1.00) + (x_z)(2.00) = 0.5$

In addition, we know that:

$$x_x + x_y + x_z = 1$$

With two linear equations in three variables, there are an infinite number of solutions. One of these is:

$x_x = 0$ $\quad$ $x_y = 0.5$ $\quad$ $x_z = 0.5$

The risk premium for this fund is:

$$r_1 = 0 \times [(1.75 \times 0.04) + (0.25 \times 0.08)]$$
$$+ (0.5) \times [(–1.00 \times 0.04) + (2.00 \times 0.08)]$$
$$+ (0.5) \times [(2.00 \times 0.04) + (1.00 \times 0.08)] = 0.14 = 14.0\%$$

9. (12 points)
One of the ways to think about market inefficiency is that it implies there is easy money to be made. The following appear to suggest market inefficiency:

(a) Strong form. The strong form says that prices reflect all information available about a company; even what is known by management.
(b) Weak form. The weak form dictates that it is impossible to make consistently superior profits by studying past returns.
(c) Semistrong form. In the semistrong form, stock prices will adjust immediately to new information, such as earnings announcements.