BEM 103 Introduction to Finance - Homework 3

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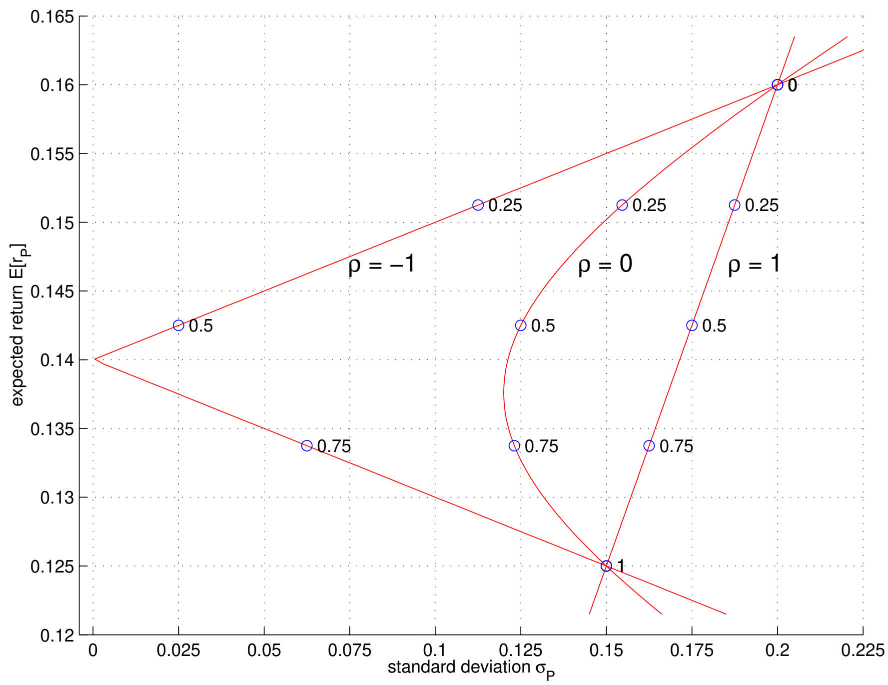
October 26, 2001

7.1 *Portfolio.*



These curves tell us:

- the expected returns do not change with ρ;
- when $\rho = -1$, there is a portfolio with zero risk;
- when $\rho = 1$, the $E[r_P] \sim \sigma[r_P]$ curve is a line connecting points standing for A and B;
- for $-1 < \rho < 1$, the $E[r_P] \sim \sigma[r_P]$ curve is always between those of $\rho = \pm 1$.

7.2 *CAPM.* $r_f = 5\%$, $E[r_m] = 14\%$, $\beta = 0.5$. The expected return of this stock is

$$E[r] = r_f + \beta(E[r_m] - r_f) = 9.5\%.$$

7.5 *Portfolio.* $\sigma[r_A] = 5\%$, $\sigma[r_B] = 20\%$, $\rho_{A,B} = 0.25$, $r_f = 5\%$. Let P be the portfolio with 25% A, 25% B and 50% risk free asset.

$$\sigma^2[r_P] = 25\%^2\sigma^2[r_A] + 2 \cdot 25\%^2 \rho_{A,B}\sigma[r_A]\sigma[r_B] + 25\%^2\sigma^2[r_B] + 50\%^2 \cdot 0 \approx 0.003\,.$$

So $\sigma[r_P] \approx 5.45\%$.

7.9 *A, B & C.*

(1) Since we have $E[r_A] < E[r_B] < E[r_C]$ and $\sigma[r_A] < \sigma[r_B] < \sigma[r_C]$, we can not say that one is definitely better than another. Different stocks could be recommended according to different tastes of return and risk.

(2) We have 3 choices:

- $\frac{1}{2}A + \frac{1}{2}B$.
$$E[r_{A,B}] = (0.06 + 0.1)/2 = 8\%, \quad \sigma[r_{A,B}] = 0.5 \times 0.1 = 5\%;$$
- $\frac{1}{2}A + \frac{1}{2}C$.
$$E[r_{A,C}] = (0.06 + 0.2)/2 = 13\%, \quad \sigma[r_{A,C}] = 0.5 \times 0.375 = 18.75\%;$$
- $\frac{1}{2}B + \frac{1}{2}C$. $E[r_{B,C}] = (0.1 + 0.2)/2 = 15\%$, and
$$\sigma[r_{B,C}] = \sqrt{0.5^2 \times 0.1^2 + 2 \times 0.5^2 \times 0.2 \times 0.1 \times 0.375 + 0.5^2 \times 0.375^2} = 20.35\%.$$

Since we also have $E[r_{A,B}] < E[r_{A,C}] < E[r_{B,C}]$ and $\sigma[r_{A,B}] < \sigma[r_{A,C}] < \sigma[r_{B,C}]$, none of these portfolio could be eliminated.

7.10 *EotW.* The discount rate for the publishing division is
$$r_P = r_f + \beta_P(E[r_m] - r_f) = 5\% + 1 \times 10\% = 15\%,$$
and that of the entertainment division is
$$r_E = r_f + \beta_E(E[r_m] - r_f) = 5\% + 1.5 \times 10\% = 20\%,$$
and for the entire firm, it is
$$r_F = r_f + \beta_F(E[r_m] - r_f) = 5\% + 1.3 \times 10\% = 18\%.$$

(1) Since any project's IRR is less than r_F, no project is acceptable from the view of the opportunity cost of capital for the entire company.

(2) Again, any project's IRR is less than the discount rate of its corresponding division, no project should be accepted.

7.11 *Misui.* $\beta_s = 1.15$, $\beta_d = 0.3$, $r_f = 6\%$ and $E[r_m] - r_f = 10\%$.

(1) From CAPM, the discount rate should be
$$r = r_f + \beta_s(E[r_m] - r_f) = 6\% + 1.15 \times 10\% = 17.5\%.$$

(2) The ratios of the debt and equity in the entire firm is 20% and 80%, respectively. Thus the entire firm has $\beta = 20\%\beta_d + 80\%\beta_s = 0.98$. So the discount rate should be
$$r = r_f + \beta(E[r_m] - r_f) = 6\% + 0.98 \times 10\% = 15.8\%.$$