Statistical Method in Finance (5010)

Home Work III

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(1) $E(R_p) = \mu_p = 16\%$, $\mu_f = 5.5\%$, $E(R_m) = \mu_m = 11\%$

$\because R_p = \mu_f + \beta(R_M - \mu_f) + \varepsilon$

$\therefore \mu_p = \mu_f + \beta(\mu_m - \mu_f)$

$\therefore \beta = (\mu_p - \mu_f)/(\mu_m - \mu_f) = (16\% - 5.5\%)/(11\% - 5.5\%)$

$= 1.909$

(2) (a) $\mu_f = 0.03$, $\mu_M = 0.14$, $\sigma_M = 0.12$, $\mu_R = 0.11$

$w = (\mu_R - \mu_f)/(\mu_M - \mu_f) = (0.11 - 0.03)/(0.14 - 0.03)$

$= 72.73\%$

$\therefore$ 72.73% of money should into the market portolio

$1 - 72.73\% = 27.27\%$ of money should into the risk-free asset.

(b) $\because \sigma_R = w \cdot \sigma_M = 72.73\% \times 0.12 = 8.73\%$

(3) $\mu_f = 0.023$, $\mu_M = 0.1$, $\sigma_M = 012$

(a) if $\sigma_R = 0.05$

$\frac{\mu_R - \mu_f}{\sigma_R} = \frac{\mu_M - \mu_f}{\sigma_M} \Rightarrow \frac{\mu_R - 0.023}{0.05} = \frac{0.1 - 0.023}{0.12} \Rightarrow \mu_R = 15.08\%$

(b) $\beta_A = \sigma_{AM}/\sigma_M^2 = 0.004/0.12^2 = 2.78$

(c) $\beta_B = 1.5$, $\sigma_{\varepsilon B} = 0.08$, $\beta_C = 1.8$, $\sigma_{\varepsilon C} = 0.1$.

(i) $\begin{cases} R_B = \mu_f + \beta_B(R_M - \mu_f) + \varepsilon_B \\ R_C = \mu_f + \beta_C(R_M - \mu_f) + \varepsilon_C \end{cases}$ and $w = \frac{1}{2}$

$\Rightarrow R_P = \frac{1}{2}R_B + \frac{1}{2}R_C$

$\Rightarrow E(R_P) = \mu_P = \frac{1}{2}E(R_B) + \frac{1}{2}E(R_C) = \frac{1}{2}(\mu_f + \beta_B(\mu_M - \mu_f)) + \frac{1}{2}(\mu_f + \beta_C(\mu_M - \mu_f))$

$= \mu_f + \frac{1}{2}(\mu_M - \mu_f)(\beta_B + \beta_C) = 0.023 + \frac{1}{2} \times (0.1 - 0.023) \times (1.5 + 1.8)$

$= 0.15005$

(ii) $Var(R_P) = Var(\frac{1}{2}R_B + \frac{1}{2}R_C) = Var(\mu_f + \frac{1}{2}(R_M - \mu_f)(\beta_B + \beta_C) + \frac{1}{2}\varepsilon_B + \frac{1}{2}\varepsilon_C)$

$= Var(\frac{1}{2}\varepsilon_B) + Var(\frac{1}{2}\varepsilon_C) + Var(\frac{1}{2}(\beta_B + \beta_C)R_M)$

$= \frac{1}{4} \times 0.08^2 + \frac{1}{4} \times 0.1^2 + \frac{1}{4} \times (1.5 + 1.8)^2 \times 0.12^2$

$= 0.043304$