Portfolio Management 2010 Final Exam
Tuesday, May 11th, 2010 Extras: Calculator
Exam time: 5 hours

Maximum score is 75 points. Minimum required to pass is 37.5p. Avoid essay question answers > one page.

1. Would you expect a well-diversified stock portfolio of firm adhering to sustainable environment norms to perform better or worse than a well-diversified portfolio of non-environmentally friendly firms? Why/why not? Discuss. (15p)

2. Define briefly following investment related terms/concepts (3p/sub-question, 15p max.)

a) Loss aversion (behaviour of an individual investor)
b) Volatility
c) Equity premium puzzle
d) Information ratio
e) Limits to arbitrage **(total 15p)**

3. Assume that you are in a CAPM-world. Calculate the missing items in the table.

Stock	Exp.return	Stand.dev.	Beta	Residual variance
A	0.11	0.24	1.2 -	0
B	0.15	-	2	0.20
C	-0.1	- 0.20	1	0
D	0.05	-	0	~~0.16~~

(15 p)

$\sigma^2 : \beta^2 \sigma^2 + \varepsilon_{(m)}$

4. Consider following data (% p.a.):

	Expected return	Standard deviation	Factor beta on F1	Factor beta on F2
Factor 1 (F1)	5%	25%	1	0
Factor 2 (F2)	2%	10%	0	1
Stock X	6.5%	50%	1.5	-0.5
Risk free rate	1%	0%	0	0

a) Suppose a two factor APT holds with F1 and F2. Does security X provide an arbitrage opportunity? **(5p)**
b) Suggest the best possible portfolio for an investor who prefers portfolio standard deviation equal to 10% p.a. **(10p)**

(total **15p**)

Please turn page!

Formulas:

(#1):

$$w_m^* = \frac{E[r_m]-rf}{A^*\sigma^2_m}$$

(#2):

$$w_S = \frac{\sigma^2_B - \sigma_{B,S}}{\sigma^2_B - 2\sigma_{B,S} + \sigma^2_S} + \frac{[E_S - E_B]}{A(\sigma^2_B - 2\sigma_{B,S} + \sigma^2_S)}$$

where E_S, E_B expected returns on stocks and bonds, and σ^2_S, σ^2_B, $\sigma_{B,S}$ are variances and covariance between S and B. rf is the riskfree rate. A is the coefficient of constant relative risk aversion.

(#3):

$$w_S = \frac{[E_S - rf]^*\ \sigma^2_B - [E_B - rf]^*\ \sigma_{B,S}}{[E_S - rf]^*\ \sigma^2_B + [E_B - rf]^*\ \sigma^2_S - \{(E_S - rf) + (E_B - rf)\}^*\ \sigma_{B,S}}$$

Note: Cov(S,B)= Corr(S,B)* σ_S *σ_B and $w_B = 1 - w_S$.

(#4): 1-factor market model holds (in excess returns)

$$r_{it} = \alpha_i + rf + \beta_i^*(r_{mt} - rf) \quad + \quad e_{it}$$

Systematic risk Unsystematic risk

α_i measures the superior (abnormal) return that the active security may have! e_{it} is assumed to have mean zero and has variance of σ_{ie}^2. Applying to #3. with S=x=the active security and B=y=passive benchmark:

$Ex = \alpha_x + rf + \beta_x^*(E[r_m]-rf)$ $\quad$ $Ey=E[r_m]$

$Var(x) = \beta_x^{2*}\sigma_m^2 + \sigma_{xe}^2$ $\quad$ $Var(y)=\sigma_m^2$

$Cov(x,y) = Cov(x,m) = \beta_x^*\sigma_m^2$

$$\boxed{w_x = \frac{\alpha_x^*\sigma_m^2}{\alpha_x^*\sigma_m^{2*}(1-\beta_x) + [E[r_m]-rf]^*\sigma^2_{xe}}}$$

and $w_y = w_m = 1 - w_x$.

$$w_x = \frac{w_0}{1 + (1-\beta_x)^* w_0} \qquad \text{where } w_0 = \frac{\alpha_x/\sigma_{xe}^2}{(E[r_m]-rf)/\sigma_m^2}$$

#5.

$$\beta_p^* = \frac{E[r_m] + a + b\alpha_m - rf}{A^*(1-\rho^2)^*\sigma^2(r_m)}$$

#6. Performance evaluation: Sharpe (Rp-Rf)/σp

Treynor (Rp-Rf)/βp, Jensen alpha = Rp-[Rf+βp*(RM-Rf)]