Real Estate Portfolio Management 2012 Final Exam
Tuesday, March 13th, 2012 **Extras: Calculator**
Exam time: 4 hours

Maximum score is 50 points. Minimum required to pass is 25p.

1. Identify main problems in implementing modern portfolio theory on the basis of realized historical price and rent data of different property types. **(10p)**

lumpy asset,

2. What are the arguments for and against direct real estate holdings for large institutional investors having large security holdings in stocks and bonds? Discuss. **(10p)**

3. A large institutional investor holds a (equally weighted) portfolio of stocks and bonds having an expected return of 10% p.a. and volatility 15% p.a. The risk free rate is 2% p.a. Real estate investments are expected to return 7%p.a. with volatility 25% p.a. The correlation between real estate investment returns and the stock/bond-portfolio returns is 0.25. What optimal weight should the institutional investor assign to real estate given that he wishes to maintain unchanged overall portfolio volatility level at 15% p.a. ? **(10p)**

4. In the beginning of last year you bought stocks in a company. The following quotations for the stock prevailed: 10.15-10.20 (bid-ask). Later that same year, in April, there was a dividend payment of 0.30 € per share. Today the quotes are 11.55–11.65, and you decide to sell the stocks. Compute the holding period return given that dividends are
a) not reinvested, **(2.5p)**
b) reinvested back into the dividend paying stock in April at a price of 10.40 € per share. **(2.5p)**

5. Assume that you are in a CAPM-world. Calculate the missing items in the table. **(10p)**

Stock	Expected return	Standard deviation	Beta	Residual Variance
A	8%	10%	0,857	0
B	12%	-	2	0.49
Market C	R_M 8,5%	-	1	0
Risk free D	Rf 5%	-	0	0.36

6. Define briefly following portfolio management-related terms (1p per term, 5p total).
a. Real rate of interest
b. Unsystematic risk
c. Beta coefficient
d. Capital Allocation Line
e. A Benchmark portfolio (or index)

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):

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

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).

$$r_{it} = \underbrace{\alpha_i + rf + \beta_i^*(r_{mt} - rf)}_{\text{Systematic risk}} + \underbrace{e_{it}}_{\text{Unsystematic risk}}$$

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. Appying 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)]