**Portfolio Management 2010 Final Exam 3/3**
**Thursday, August 26th, 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.  How does the possibility of survivorship bias affect the expected equity market risk premia in international stock markets? Discuss. **(15p)**

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

    a) The Book-To-Market effect (in stock investing).
    b) Post-earnings-announcement drift.
    c) Name circumstances when active asset allocation can be profitable.
    d) Suppose all risky assets have identical volatility of 30% p.a. and pairwise correlations of 0.4. What is the volatility of a very large equally weighted portfolio?
    e) Suppose the expected market return is 10% p.a. and the market volatility is 15% p.a. and the risk free rate is 3% p.a. What is the optimal portfolio recommendation for a client with CRRA=6?

3. Following scenario prevails for stocks X and Y:

|             | Bear market | Normal market | Bull market |
|-------------|-------------|---------------|-------------|
| Probability | 0.2         | 0.5           | 0.3         |
| Stock X     | -20%        | +18%          | 50%         |
| Stock Y     | -15%        | 20%           | 10%         |

a) What are the expected rates of return for stocks X and Y? **(2p)**
b) What are the standard deviations of return for stocks X and Y? **(3p)**
c) Assume that of your 10000e portfolio, you invest 9000€ in stock X and 1000€ in stock Y. What is the expected return on your portfolio? **(5p)**
                                                                        **(10 p total)**

4. You assume that the returns on U.K. stocks are described by a three-factor APT model. In the table below you find the factor sensitivities and the average rates of returns for four stocks. You assume that the relationship defined in the table will not change in the future. The risk-free rate Rf is 3% p.a.

|      | Stock b1 = long term interest rate sensitivity | b2 = oil price sensitivity | b3 = exchange rate sensitivity on EUR/GBP | Average rate of return p.a. |
|------|------|------|------|------|
| ROG  | 0.2  | -0.2 | 0.8  | 9.60%  |
| CSGN | 0.7  | 0.1  | 0.6  | 8.10%  |
| SGS  | 0    | 0.8  | 0.7  | 14.00% |
| ABBN | 0.6  | -0.2 | 0.7  | 7.80%  |

(4. continued)

a) Compute the risk premium paid for each factor assuming a market at equilibrium, knowing that the oil price risk premium is 5%. a) What are the expected rates of return for stocks X and Y? (6p)

b) You have to construct a portfolio consisting of all 4 stocks above totally insensitive to the oil price. One of your colleagues proposes to include 12.5% of ROG, 25.0% of CSGN, 12.5% of SGS and 50% of ABBN. What are the values $\beta 1$, $\beta 2$ and $\beta 3$ of the coefficients of the new portfolio? Should you follow your colleague's proposition? Are there other portfolios that share the same property but which have a higher expected return? Justify your answer. (5p)

c) Your research team gives you the factor sensitivities for the stock Adecco (ADEN): $\beta_{1ADEN} = 0.32$, $\beta_{2ADEN} = 0$, $\beta_{3ADEN} = 0.57$. It also tells you that the expected return of ADEN is 11.35%. What can you say about the pricing of ADEN? (3p)

d) Compare a portfolio consisting of 30% ROG, 20% CSGN, 10% SGS, 20% ABBN and 20% Cash with the ADEN stock. What happens in an efficient market? Explain with explicit calculations. (6p)                    (total    20p)


5. You hold a 1 MEUR Finnish stock portfolio which promises an expected return of 9% and volatility of 25%. The riskfree rate is 4% p.a. You would like to maintain 25% portfolio volatility but earn a higher return through international diversification. You have found five extremely broadly diversified global mutual funds with following (net) expected returns and volatilities (%p.a):

| Portfolio | Expected return | Volatility |
|---|---|---|
| A | 7.0% | 20% |
| B | 5.6% | 8% |
| C | 7.6% | 12% |
| D | 6.4% | 10% |
| E | 8.8% | 15% |

As far as you know, these five portfolios are perfectly positively correlated with each other. However, they all have a correlation of only +0.5 to the Finnish portfolio you currently hold.

How much more (expected) return could you earn, at the same level of risk that you currently hold (=25% volatility), if you diversify globally in an optimal fashion?
                    (total 15p)

# Formulas:

(#1):
$$w_m^* = \frac{E[r_m]-rf}{A*\sigma_m^2}$$

(#2):
$$w_S = \frac{\sigma_B^2 - \sigma_{B,S}}{\sigma_B^2 - 2\sigma_{B,S} + \sigma_S^2} + \frac{[E_S - E_B]}{A(\sigma_B^2 - 2\sigma_{B,S} + \sigma_S^2)}$$

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

(#3):
$$w_S = \frac{[E_S -rf]* \sigma_B^2 - [E_B -rf]* \sigma_{B,S}}{[E_S -rf]* \sigma_B^2 +[ E_B -rf]* \sigma_S^2 -\{( E_S -rf)+( E_B -rf)\}* \sigma_{B,S}}$$

Note: $Cov(S,B)= Corr(S,B)* \sigma_S *\sigma_B$ 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 $\qquad\qquad$ Unsystematic risk

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

$Ex = \alpha_x + rf + \beta_x*(E[r_m]-rf)$ $\qquad$ $Ey=E[r_m]$
$Var(x) = \beta_x^2*\sigma_m^2 + \sigma_{xe}^2$ $\qquad\qquad$ $Var(y)=\sigma_m^2$
$Cov(x,y) = Cov(x,m) = \beta_x*\sigma_m^2$

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

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