OULUN YLIOPISTO
UNIVERSITY of OULU

YLIOPISTOTENTTILOMAKEPOHJA / UNIVERSITY EXAM TEMPLATE

Opintojakson koodi and nimi / The code and the name of the course: **724208A Portfolio Theory**	
Tiedekunta / Faculty: OBS / OYKKK	
Tentin pvm / Date of exam: 18.1.2016	**Tentin kesto tunteina / Exam in hours: 4**
Tentin nro / No. of the exam: 2nd retake (Tentti, 1. uusinta, 2. uusinta / Exam, 1. retake, 2. retake)	**Opintopistemäärä / Credit units: 5**
Tentaattori(t) / Examiner(s): Andrew Conlin	**Sisäinen postios. / Internal address: 6OyKKK**
Sallitut apuvälineet / The devices allowed in the exam: ☒ Nelilaskin / Standard calculator ☒ Funktiolaskin / Scientific calculator ☒ Ohjelmoitava laskin / Programmable calculator ☐ Muu materiaali, tarkennettu alla / Other material, specified below:	
Tenttiin vastaaminen / Please answer the questions: ☒ Suomeksi / in Finnish ☒ Englanniksi / in English	
Kysymyspaperi on palautettava / Paper with exam questions must be returned: ☐ Kyllä / Yes ☒ Ei / No	

The exam consists of 10 quantitative questions (2 points each) and 5 short-answer essay questions (4 points each). You need 20 points to pass the exam. There is a formula sheet attached. You may answer in English or Finnish. If you answer in Finnish, use yleiskieli. **WRITE CLEARLY and SHOW YOUR WORK** (no credit for answers if you do not show your work!)

Answer this first!! (write your response on the answer sheet!)
I wish to use my midterm bonus points for this exam: YES NO

Part 1 Quantitative questions

Questions 1 and 2 are related.

You sold short 100 shares of GE at a price of $31. The initial margin is 50%. You earn no interest on the funds in your account and the cost of borrowing the shares is 0.25%.

1. If the maintenance margin is 35%, how high can the stock go before you get a margin call?

2. GE paid a dividend of $0.23 per share when you held the short position. If you covered the short position at a price of 28.50, what was your return on the short position?

3. You just invested $30,000 in a mutual fund (1000 shares x $30/share). The price you paid included a 5% front-end load. The fund's expense ratio is 1.3%. If the fund value decreases by 10% over the next year, what will be the return on your investment if you sell the shares one year from now?

Questions 4-6 are use the following information:

Stock fund A has $E(r_A)$ = 17% and σ_A=0.25. Bond fund B has $E(r_B)$= 7% and σ_B=0.14. The covariance between A and B is $Cov(r_A,r_B)$ = 0.014. The risk free rate is 3%. Your level of risk aversion is 4.

4. What are the weights of A and B in the minimum variance portfolio?

5. What are the weights of A and B in the optimal risky portfolio?

6. How much of your money should you invest in the optimal risky portfolio?

7. You just bought 3 ETFs to make a portfolio. You bought 100 shares of SPY at $191.50; 50 shares of IWM at 100; and 200 shares of EWJ at 11.25. You plan to sell all the shares 1 year from now. If you receive the following prices SPY 194.20; IWM 112.80; and EWJ 15.75, what is the return on the portfolio?

8. Assume the CAPM model. The risk-free rate is 2.5%. Stock Y has E(r) = 5.9% and β_Y = 0.4. If Stock Z has β_Z = 2.1, what is the E(r) for Stock Z?

9. Consider a multifactor model with two systematic risk factors F_1 and F_2. The returns on the factor portfolios are 9% and 3.5% respectively. The risk-free rate is 1.5%. A well-diversified portfolio X has $\beta_{X,F1} = 1.75$ and $\beta_{X,F2} = 1.3$. What is the expected return on portfolio X?

10. You have a utility function of the form $U = E(r) - ½A\sigma^2$. The risky portfolio has E(r) = 19% and $\sigma = 37\%$ The risk-free rate is 4%. If you have 62.6% of your money invested in the optimal risky portfolio, what is your level of risk aversion?

Part 2 Write maximum 2 paragraphs (tekstikappale) per question. Write complete ideas; do NOT just list vocabulary words.

1. You are the manager of a diversified mutual fund. Currently, you have 65% of the fund's money invested in equities, 30% in bonds, and 5% in cash. The correlation between equities and bonds has been 0.1, but you expect the correlation to be 0.5 for the next 5 years. Will you change the funds allocation? (hint: you can make some assumptions about the expected returns and variances of stocks and bonds).

2. True/False and explain: If we want to create an index that will provide a good measure of the performance of all the stocks trading in Helsinki, we should create an equal-weighted index instead of a market-weighted index.

3. The price of oil has fallen dramatically over the past 18 months. You want to start a hedge fund to buy oil and oil-sector stocks. Discuss how "performance based arbitrage" (part of limits to arbitrage) may affect your fund.

4. How do representative bias (sample size neglect) and overconfidence affect investor behavior?

5. Define the efficient frontier and explain its role in optimal portfolio construction.

Formula Sheet - *Kaavakokoelma*

$$(1+R)=(1+r)(1+i)$$

$$APR=\frac{(1+EAR)^{T}-1}{T}$$

$$\sigma^2 = \sum_s p(s)\left[r(s) - E(r)\right]^2, \quad \sigma = \sqrt{\sigma^2}$$

$$Cov(r_i, r_j) = \sum_s p(s)\left[r_i(s) - E(r_i)\right]\left[r_j(s) - E(r_j)\right]$$

$$S = \frac{E(r_P) - r_f}{\sigma_P}$$

$$y^* = \frac{E(r_P) - r_f}{A\sigma_P^2}$$

$$E(r_p) = \sum_{i=1}^{n} w_i E(r_i)$$

$$\sigma_p^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j Cov(r_i, r_j)$$

$$Cov(r_i, r_j) = \rho_{ij} \sigma_i \sigma_j$$

$$w_{A_{Min}} = \frac{\sigma_B^2 - Cov(r_A, r_B)}{\sigma_A^2 + \sigma_B^2 - 2Cov(r_A, r_B)}; w_{B_{Min}} = 1 - w_{A_{Min}}$$

$$w_A = \frac{[E(r_A) - r_f]\sigma_B^2 - [E(r_B) - r_f]Cov(r_A, r_B)}{[E(r_A) - r_f]\sigma_B^2 + [E(r_B) - r_f]\sigma_A^2 - [E(r_A) - r_f + E(r_B) - r_f]Cov(r_A, r_B)}; w_B = 1 - w_A$$

$$E(R_i) = \alpha_i + \beta_i E(R_M)$$

$$\sigma_{i_{or}P}^2 = \beta_{i_{or}P}^2 \sigma_M^2 + \sigma^2(e_{i_{or}P})$$

$$Cov(r_i, r_j) = \beta_i \beta_j \sigma_M^2$$

$$\alpha_P = \sum_{i=1}^{n} w_i \alpha_i; \quad \beta_P = \sum_{i=1}^{n} w_i \beta_i; \quad \sigma^2(e_P) = \sum w_i^2 \sigma^2(e_i)$$

$$w_i^0 = \frac{\alpha_i}{\sigma^2(e_i)} \rightarrow w_i = \frac{w_i^0}{\sum_{i=1}^{n} w_i^0}$$

$$w_A^0 = \frac{\alpha_A / \sigma^2(e_A)}{E(R_M) / \sigma_M^2} \rightarrow w_A^* = \frac{w_A^0}{1 + (1 - \beta_A) w_A^0}$$

$$S_P^2 = S_M^2 + \left[\frac{\alpha_A}{\sigma(e_A)}\right]^2$$

$$E(r_i) = r_f + \beta_i \left[E(r_M) - r_f\right]$$

$$\beta_i = \frac{Cov(r_i, r_M)}{\sigma_M^2}$$

$$E(r_P) = r_f + \beta_{P1}\left[E(r_1) - r_f\right] + \beta_{P2}\left[E(r_2) - r_f\right] + \ldots$$