OULUN YLIOPISTO
UNIVERSITY of OULU

YLIOPISTOTENTTILOMAKEPOHJA / UNIVERSITY EXAM TEMPLATE

Koskee tiedekuntia LuTK, OyKKK, KaTK, TTK, TST ja BMTK (Linnanmaan tentit) /
Concerns Faculties SCI, OBS, OMS, TECH, ITEE and BMM (Linnanmaa campus)

Tentin päivämäärä / Date of exam: **7.12.2015**	Tentin kesto tunteina / Exam in hours: **4**
Tiedekunta / Faculty: **OBS / OyKKK**	
Opintojakson koodi, nimi ja tentin numero / The code and the name of the course and number of the exam: **724208A Portfolio Theory (2nd exam)**	
Tentaattori(t) / Examiner(s): **Andrew Conlin**	Sisäinen postios. / Internal address **6 OyKKK**
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.

1. You just bought 1000 shares of Kone on margin. You paid 38€ per share. The initial margin is 50%. The maintenance margin is 30%. How low can the price go before you get a margin call?

2. The interest rate on the loan form your broker is 3%. Assume you sell the shares 1 year from now at a price of 45€. The company does not pay a dividend. What is the return on your investment?

3. The current price of AMZN stock is $500. The stock price goes down by 50% in the first year, then moves up 25% the second year, and moves up again 25% in the third year. What is the price of the stock after the third year?

4. Assume one risky asset and one risk-free asset. The risky asset has $E(r_p)=12\%$ and $\sigma_p=0.25$. The risk-free rate is 3%. Your risk aversion is 2.5. What is the expected return on your optimal complete portfolio?

Questions 5 and 6 use the following information:
Your portfolio has two stocks in it, A and B, and also US T-bills. The weights are $w_A=65\%$ and $w_B=25\%$ and $w_{tbill} = 10\%$. The expected returns are $E(r_A) = 15\%$, $E(r_B) = 8\%$, and $r_{tbill} = 1.5\%$. You also know $\sigma_A = 0.32$ and $\sigma_B = 0.19$ and $Cov(r_A,r_B) = 0.02736$.

5. What is the expected return on your portfolio?

6. What is the standard deviation of your portfolio?

7. Assume the CAPM model. The risk-free rate is 3%. Stock Y has $E(r) = 16.5\%$ and $\beta_Y = 1.5$. If Stock Z has $E(r) = 25.5\%$, what is β_Z ?

Questions 8-10 are use the following information:
Stock A has $E(r_A) = 19\%$ and $\sigma_A = 0.35$. Stock B has $E(r_B)= 7\%$ and $\sigma_B = 0.13$. The covariance between A and B is $Cov(r_A,r_B) = 0.011375$ The risk free rate is 3%. Your level of risk aversion is 3.5.

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

9. What are the weights in the optimal risky portfolio?

10. What are the weights of A, B, and the risk-free rate in the optimal complete portfolio?

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

1. Explain why everyone holds the same risky portfolio in the CAPM model.

2. True/False and Explain: Because the market is nearly efficient, ALL investors should just invest passively.

3. What do we mean by "limits to arbitrage" and why is this idea so important for Behavioral Finance?

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

5. Can mutual fund managers beat the market? Discuss the views both for and against.

Formula Sheet - *Kaavakokoelma*

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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