Stockholm University
Department of Economics

Course name:	Financial Economics
Course code:	EC2206
Type of exam:	Retake
Examiner:	Roine Vestman
Number of credits:	7.5 credits
Date of exam:	December 4, 2018
Examination time:	9:00-13:00 (4 hours)

Write your identification number on each answer sheet (the number stated in the upper right hand corner on your exam cover).

Start each new question on a new answer sheet.

Explain notions/concepts and symbols. If you think that a question is vaguely formulated, specify the conditions used for solving it. Only legible exams will be marked.

A pocket calculator is allowed as long as it is not programmable.

The exam consists of 6 questions. There are 100 points in total, including the credit question. The credit question is meant for students who did not hand in the problem set and for students who received less than 10 points and wish to improve. For students who handed in the problem set, the credit question only counts if it improves the total score. For the grade E a total of 45 points are required, for D 50 points, C 60 points, B 75 points and A 85 points.

Your results will be made available on your Ladok account (www.student.ladok.se) within 15 working days from the date of the examination.

Good luck!

Exam December 4, 2018 (Financial Economics, EC2206)

See formula sheet at the back. A pocket calculator is allowed as long as it is not connected to the internet or is programmable. Upon request, the memory of the calculator should be erased.

Question 1: Smaller questions (25 points)

These questions (a. to d.) can be answered independently.

a. Figure 1 depicts the Security Market Line. Suppose there are two equity mutual funds denoted A and B that both charge a management fee of 2%. Fund A holds the stock market index and 50% cash. Fund B holds the stock market index and 10% cash. Cash earns the risk-free rate, r_f. The market risk premium is $E[r_M - r_f] = 4\%$.

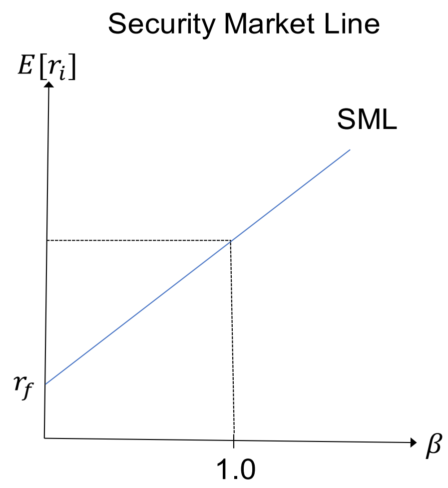
   i. Write down a mathematical expression for each fund i's return, r_i, net of the fee (which can be denoted by f_i). (2 points)

   ii. Using the formula $\beta_i = \frac{cov(r_i - r_f, r^M - r_f)}{var(r^M - r_f)}$, compute each fund i's CAPM-beta. (4 points)

   iii. Compute each funds' expected excess return, net of the fee. (2 points)

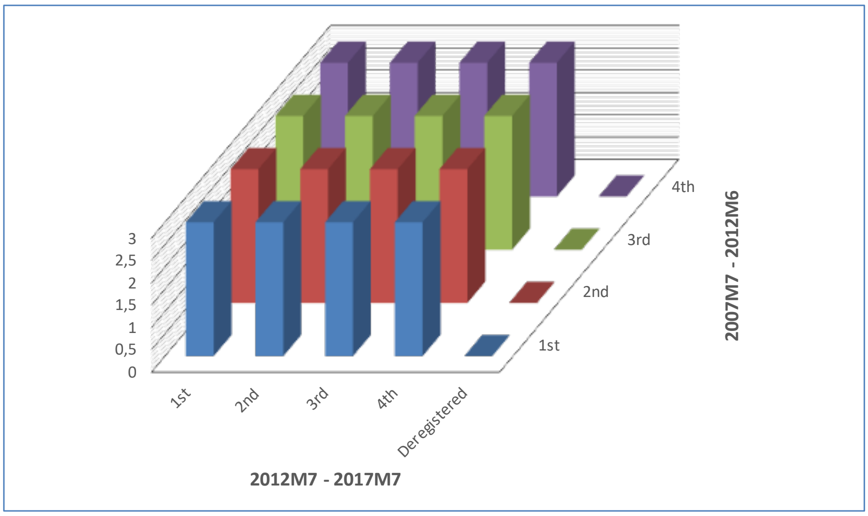
   iv. Draw your own version of Figure 1 and correctly locate the two funds along the horizontal axis, relative to the SML, relative to each other, and relative to the risk-free asset. Please take into account the fees. (2 points)

Figure 1: **The SML**



b. Figure 2 depicts a hypothetical joint distribution of mutual fund returns over two consecutive time periods. According to the figure, do past fund returns predict future fund returns? (5 points)

Figure 2: **Joint distribution of mutual fund returns**



c. Suppose that you have found an optimal portfolio P of risky assets which will have a stochastic return r_p. It has an expected return denoted by $E[r_p]$ and a volatility denoted by σ_p. You form your complete portfolio C by deciding on the portfolio weight y invested into P and the weight $1 - y$ invested into the risk-free asset which has a deterministic return r_f.

i. Write down an expression for the return on the complete portfolio, r_c. (1 point)

ii. Suppose you have preferences given by $U(y) = E[r_c] - \frac{1}{2}A\sigma_c^2$ where A is a parameter that determines risk aversion, $E[r_c]$ is the expected return on the complete portfolio and σ_c^2 is the variance of the complete portfolio. Solve for the optimal weight in P as a function of $E[r_p]$, r_f,A, and σ_p. (4 points)

d. Explain what a deep market is. Your explanation should involve the bid price, the asking price, and the order book. Feel free to refer to the stock H&M B discussed in Lecture 1. Contrast a deep market to a thin market. (5 points)

Question 2: Bond pricing (20 points)

Consider a two-period corporate bond with the following characteristics. The bond was issued at $t = 0$ with face value $FV = 100$ at $t = 2$. In period $t = 1$ and $t = 2$ coupons of 5 are paid out ($c = 5$). We are now in $t = 1$ and the bond issuer has just paid the first coupon. The price of the bond is 101.942.

a. Compute the yield to maturity on the bond (5 points)

b. Suppose that there is a very credit worthy hedge fund that today (i.e., in $t = 1$) can issue a one-period zero-coupon bond with face value of 105 in $t = 2$ for 102 today.

   i. What is the yield to maturity on this hypothetical bond? (5 points)

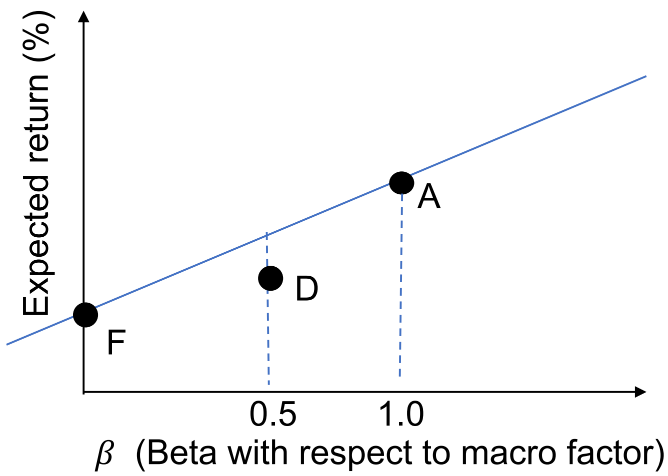
   ii. Describe a profitable investment strategy for the hedge fund. Provide motivating calculations and a time line of cash-flows. Ignore default risks. What is the transaction cost F that makes the strategy unprofitable? (10 points)

Question 3: Arbitrage pricing theory (15 points)

Assume that the assumptions of APT hold.

a. Describe a trading strategy involving the well-diversified portfolios (A,D,F) depicted in Figure 3, or a subset of them, that exploits an arbitrage opportunity. Describe the strategy in detail – in particular the weights put in each of the portfolios. (5 points)

Figure 3: **SML with respect to macro factor**



b. Describe how to construct Eugene Fama's and Kenneth French's SMB and HML factors. According to the interview with Fama, do the factors represent risk or an arbitrage opportunity? (5 points)

c. From the point of view of Fama, what is "problematic" about the momentum (MOM) factor? (5 points)

Question 4: The CAPM (15 points)

a. State the assumptions of CAPM. (3 points)

b. Choose three of the assumptions that you stated in part (a). Provide arguments why they are unlikely to hold. Please be brief. (3 points)

c. Imagine a stylized world where the market portfolio consists of two securities, $i = 1, 2$ and all assumptions of CAPM hold. Further, assume that the weight of security 1 in the market portfolio is $w_1 = 0.5$ and that the covariance matrix is given below. Compute the variance of the market portfolio, σ_M^2. (4 points)

	r_1	r_2
r_1	0.20	0.10
r_2	0.10	0.20

d. Compute the CAPM-betas of security 1 and security 2, i.e. β_1 and β_2. (2 points)

e. Assume that $E[r_M] = 0.05$ (i.e., 5%) and $r_f = 0.01$ (i.e., 1%). Compute the expected return of both securities and their Sharpe ratios. (3 points)

Question 5: Financial Crises (10 points)

This is an essay question. Nevertheless, please be brief and to the point. **Your total answer should not exceed 2 pages.**

a. Describe how traditional securitization of mortgage backed securities worked in, say, the 1990s. (Who were the main players? What kind of mortgages were securitized? Illustrate with a value chain.) Then contrast to how securitization evolved in the early 2000s in the boom phase of the financial crisis. Describe the main differences and the appearing moral hazards. (5 points)

b. In chapter 20 of Mankiw's text book, six common features of a financial crisis are listed. Describe these features very briefly without necessarily making references to any specific crisis. (5 points)

Question 6: Questions for credit score (10 points)

Credit question. This question should only be answered by students who either did not hand in the problem set or by students who received a score below 10 on the problem set and wish to try to improve. In the latter case, the best of the two scores will be counted.

Consider two random variables, x and y, and two numbers, a and b. Show that $var(a \cdot x + b \cdot y) = a^2 \cdot var(x) + b^2 \cdot var(y) + 2 \cdot a \cdot b \cdot cov(x, y)$. Hint: First treat $a \cdot x$ and $b \cdot y$ as two random variables. Then show linearity of the covariance function. (10 points)

Formula sheet – Financial Economics (EC2206)

- The variance of a random variable x: $var(x) = E[(x - E[x])^2]$
- The covariance of two random variables x and y: $cov(x, y) = E[(x - E[x])(y - E[y])]$
- The variance of the sum of two random variables: $var(x + y) = var(x) + var(y) + 2 \cdot cov(x, y)$
- Covariances are additive: cov(x,z)+cov(y,z)=cov(x+y,z)
- The Sharpe ratio of a security: $\frac{E[r-r_f]}{std(r)}$
- For two risky assets with excess returns R_E and R_D, the optimal risky portfolio P is given by:

$$\begin{aligned} w_D &= \frac{E[R_D]\sigma_E^2 - E[R_E]cov(R_D, R_E)}{E[R_D]\sigma_E^2 + E[R_E]\sigma_D^2 - [E[R_D] + E[R_E]]cov(R_D, R_E)} \\ w_E &= 1 - w_D \end{aligned}$$

- The single-index model and the information ratio:
  - If $\beta_A = 1$ the weight in the active portfolio equals $w_A^0 = \frac{\alpha_A/\sigma_{e,A}^2}{E[R_M]/\sigma_M^2}$.
  - Otherwise $w_A^* = \frac{w_A^0}{1+(1-\beta_A)w_A^0}$.
  - The weight of each security in the active portfolio is $\frac{\alpha_i/\sigma_{e_i}^2}{\Sigma\alpha_i/\sigma_{e_i}^2}$.
  - The Sharpe ratio of the risky portfolio equals: $S_P = \sqrt{S_M^2 + [\frac{\alpha_A}{\sigma e,A}]^2}$.
- The equation $x^2 + px + q = 0$ has solutions $x = -\frac{p}{2} \pm \sqrt{(\frac{p}{2})^2 - q}$
- Bond pricing:
  - Given a market rate r, the value of a perpetuity that pays a coupon c forever is: $\frac{c}{r}$
  - The value of an annuity with coupons c and duration T is: $\frac{c}{r}\left[1 - \frac{1}{(1+r)^T}\right]$