

Examiner: Prof. Dr. Peter Reichling

Student Name _____

Matriculation Number _____

The following aids can be used: **non-programmable pocket calculator**.

This examination comprises **4 parts (4 pages)**. All of them are to be attempted. There are 120 points total. The number of points for each section is indicated.

Part I: Multiple Choice Questions. This section contains questions the answers for which should be chosen from the corresponding options. Each question has only one right answer. The section will be evaluated in the following way: If a question is not answered, it yields 0 (zero) points; if answered correctly, it yields 1 (one) point; if answered incorrectly, it yields -1 (minus one) point. However, if the total number of points for the section is negative, the number will be normalized to 0 (zero).

Part II: "Short" Questions. Short explanation (2-3 sentences) is required to answer each question.

Part III: Essay Questions. Answers to this type of questions (5-6 sentences) if required should contain graphs, mathematical proofs.

Part IV: Quantitative Questions. This section contains questions which require some computational work. Sometimes it might be necessary to provide explanation of the results.

RETURN the question sheets when the examination is finished. Otherwise, the Part I will be considered to be **FAILED !**

EXAMINATION QUESTIONS.

PART I: MULTIPLE CHOICE QUESTIONS. (15 POINTS)

1. Which statement about portfolio diversification is correct?
 - a. Proper diversification can reduce or eliminate systematic risk.
 - b. Diversification reduces the portfolio's expected return because it reduces a portfolio's total risk.
 - c. As more securities are added to a portfolio, total risk typically would be expected to fall at a decreasing rate.
 - d. The risk-reducing benefits of diversification do not occur meaningfully until at least 30 individual securities are included in the portfolio.

2. Portfolio theory as described by Markowitz is most concerned with:
 - a. The elimination of systematic risk.
 - b. The effect of diversification on portfolio risk.
 - c. The identification of unsystematic risk.
 - d. Active portfolio management to enhance return.

3. What is true from the following?
 - a. Stocks with a beta of zero offer an expected rate of return of zero.
 - b. The CAPM implies that investors require a higher return to hold highly volatile securities.
 - c. You can construct a portfolio with beta of .75 by investing .75 of the investment budget in the market portfolio and the remainder in risk-free securities.

4. The security market line (SML) depicts:
- a. A security's expected return as a function of its systematic risk.
 - b. The market portfolio as the optimal portfolio of risky securities.
 - c. The relationship between a security's return and the return on an index.
 - d. The complete portfolio as a combination of the market portfolio and the risk-free asset.
5. What is the expected return of a zero-beta security?
- a. Market rate of return.
 - b. Zero rate of return.
 - c. Negative rate of return.
 - d. Risk-free rate of return.
6. Assume the correlation coefficient between Fund X and the S&P500 Stock Index is .70. What percentage of Fund's total risk is specific (i.e., nonsystematic)?
- a. 30%.
 - b. 49%.
 - c. 51%.
 - d. 70%.
7. Beta and standard deviation differ as risk measures in that beta measures:
- a. Only unsystematic risk, while standard deviation measures total risk.
 - b. Only systematic risk, while standard deviation measures total risk.
 - c. Both systematic and unsystematic risk, while standard deviation measures only unsystematic risk.
 - d. Both systematic and unsystematic risk, while standard deviation measures only systematic risk.
8. Consider a 5-year bond with a 10% coupon that has a present yield to maturity of 8%. If interest rates remain constant, one year from now the price of this bond will be:
- a. Higher.
 - b. Lower.
 - c. The same.
 - d. Par.
9. The 1-year zero-bond spot rate is 4%, and the 2-year zero-bond spot rate is 5%. The implied 1-year forward rate for an investment starting in one year is approximately:
- a. 3.0%.
 - b. 4.5%.
 - c. 5.5%.
 - d. 6.0%.
10. The interest rate risk of a bond normally is:
- a. Greater for shorter maturities.
 - b. Lower for longer duration.
 - c. Lower for higher coupons.
 - d. None of the above.
11. Which bond has the longest duration?
- a. 8-year maturity, 6% coupon.
 - b. 8-year maturity, 11% coupon.
 - c. 15-year maturity, 6% coupon.
 - d. 15-year maturity, 11% coupon.

12. According to the dividend discount model, a fall in the hurdle rate will cause a stock's value to:
- a. Decrease.
 - b. Increase.
 - c. Remain unchanged.
 - d. Decrease or increase, depending on other factors.
13. Which of the following is *not* an assumption of CAPM:
- a. Investments are limited to a universe of publicly traded assets.
 - b. All investors analyze securities in the same way and share the same economic view of the world.
 - c. Investors pay no taxes on returns and no transaction costs.
 - d. Stocks pay no dividends.
14. Which of the following is false:
- a. Spot rates can be inferred only from zero-bonds.
 - b. When the term structure is flat, the yield of a coupon-bond is equal to its coupon rate.
 - c. Different bonds with the same maturity may have different yields.
 - d. Yield is a rate which equates all future cash flows of a bond to its price.
15. Which of the following is false:
- a. The CML uses systematic risk as its risk proxy.
 - b. Beta measures the extent to which returns on the stock and the market move together.
 - c. A security which lies under the SML is too expensive relatively to the market.
 - d. It is a risk premium that determines the slope of the SML.

PART II: "SHORT" QUESTIONS. (30 POINTS)

1. Given two zero-bonds, which mature in one and in two years, respectively, how is it possible to sure today the interest rate for an investment which would start in one year and last 12 months?
2. If on the market you have bonds which are not equally spaced with the respect to maturity, how can you still bootstrap the spot curve?
3. How can the duration of a bond be interpreted? (Provide only two interpretations!)
4. Show graphically the σ - μ trade-off of two assets which have the correlation coefficient (i) $\rho = -1$, (ii) $\rho = 1$, (iii) $\rho = 0$. In what case it is most optimal to combine these two assets?
5. Why might one stock have different betas? (Name at least two reasons and shortly explain them!)
6. Why does not Jensen's alpha allow ranking? Explain it on a small example.

PART III: ESSAY QUESTIONS. (30 POINTS)

1. Show graphically μ - σ trade-off between the tangent portfolio and the risk-free investment. Prove mathematically that the relationship between them is linear. Interpret the graph.
2. What is minimum variance portfolio? (Show it graphically and explain verbally.) If you have simply two securities, in what case the MVP contains only one security? (Show it graphically and briefly explain. Just one example would be enough.)
3. How can the CAPM be tested? (Line out formally one of the possible tests.)

PART IV: QUANTITATIVE QUESTIONS. (45 POINTS)

Problem 1.

Consider the data in the table to answer the following questions:

	t_1	t_2
2001	4.5%	5%
2002	5.75%	6.25%
2003	6%	6.5

The second line of the table indicates the spot rates for 1 and 2 year investments which prevailed in 2001. The third line of the table indicates the spot rates for 1 and 2 year investments which prevailed in 2002 and so on.

- For each year compute the forward rates for investments which would have started in the end of t_1 and seized in the end of t_2 .
- Compute the correlation coefficient between the forward rates in (a) with the spot rate which were realized later. (*Hint*: On the basis of the available information, it is possible to find correlation only between two forward rates and two corresponding spot rates! Be sure that you choose the right forward and spot rates!)
- Briefly interpret your result form (b). (1-2 sentences)

Problem 2.

You have an obligation to pay a series of cash outflows based on the following schedule:

(Years)	Liability
1	€50
2	€60
3	€70
4	€80

On the market you can observe two bonds: 2-year bond with 10% coupon, and 5-year bond with 8% coupon. Suppose that the yield curve is flat at 6% p.a. What immunization strategy would you pursue to hedge the risk resulting from possible changes in the interest rate?

Problem 3.

Consider the following tables:

Table 1. Covariance matrix

Stock	A	B	C
A	0.04		
B	0.01	0.05	
C	0.03	0.02	0.06

Table 2. Expected returns

Stock	μ
A	10%
B	12%
C	13%

- Consider an equally weighted portfolio which contains stocks A, B, and C. Compute the expected return and the standard deviation of this portfolio.
- Is this portfolio optimal? Explain shortly! (2-3 sentences and a small graph would be enough.)