School of Business and Economics

Exam: Finance
Code: E_IBA2_FIN

Examinator: Dr. M.B.J. Schauten
Co-reader: Prof. Dr. M.J. van den Assem

Date: 22 December 2022
Time: 15.30 – 17.30 hrs
Duration: 2 hours

Calculator allowed: yes
Graphical calculator allowed: no
Scrap paper allowed: yes
Open book exam: no

Type of questions: 16 multiple choice and 3 open questions
Answer in: English

Remarks:
Answer the **multiple choice questions** by filling the corresponding box. For each question, only one answer is correct (a, b, c or d). Answer all questions (giving no answer = giving a wrong answer). The answers to the **open questions** should be written in the space below the open questions. Numbers are in European (Dutch) format with decimal commas, and dots separating thousands (e.g. 1.234.567,89).

If you have to show a calculation when answering an open question, use "SQRT" followed by the number for the square root of that number (e.g. SQRT(4) for the square root of 4). For an exponent, use the "^" character followed by the exponent (e.g. 3^2 for 3 to the power 2). For multiplication use "×" or "*" and for dividing use ":" or "/". For addition and subtraction use "+" and "-" as usual. It is also allowed to describe your calculation in words.

Credit score:
The maximum score for the mc questions is 72 points. To determine the score we take into account the expected number of correct answers when answers are given randomly. The maximum score for the open questions is 18 points. The final grade for this exam is: [total number of points + 10] / 10.

Grades:
At the latest the grades will be made public on 19 January 2023.
Inspection: tba

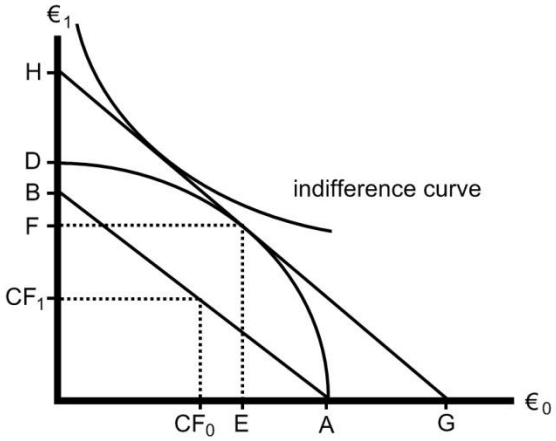
By taking this exam, you confirm that:
- You are the student who should participate in this exam;
- You will make this exam individually, without assistance of others, without using prohibited resources, as stipulated in the exam instructions and the SBE Regulations and Guidelines;
- You will adhere to academic standards and conduct, throughout the exam.

If you have **not** signed up for this exam, you will not receive a result. Through VU.nl you can object to the fact that you can no longer sign up after the expiry of the registration deadline (and the fact that you will not receive a result for this exam). Submit your appeal online within one week after the exam. More information can be found at www.vu.nl/intekenen.

Part A: MC questions (72 points)

Number of points mc questions = (number of correctly answered questions – 4) × 6

1.
Assume a world according to the Hirshleifer model. At t = 0, Lucas' income is €150,00 (CF_0), Lucas consumes €80,00 (C_0) and invests €50,00 in real investment projects (EA). At t = 1, Lucas' income is €86,70 (CF_1). The internal rate of return of the real investment projects is 20,0%. The risk-free interest rate is 2,00%. Consider the figure below (not drawn to scale).

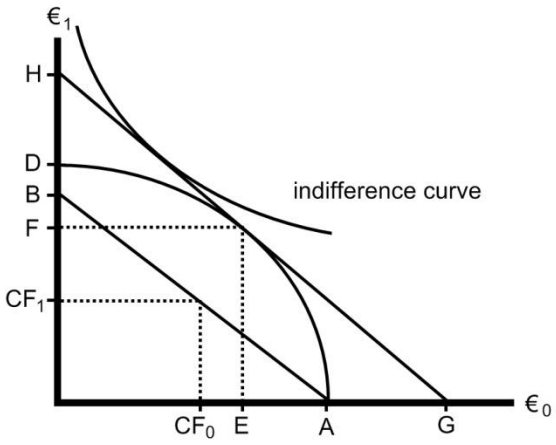


Question: The net present value of the real investment projects is closest to

a. €5
b. €7
c. €9
d. €11

2.

Assume a world according to the Hirshleifer model. The income of Romy is €40,00 (CF_0) at t = 0 and €61,20 (CF_1) at t = 1. At t = 0, Romy invests €45,00 in real investment projects (EA) and borrows €15,00. The risk free rate is 2,00%. Consider the figure below (not drawn to scale). The maximum consumption at t = 0 (OG) is €120,00.



Question: The consumption of Romy at t = 1 (C_1) is closest to

a. €108
b. €112
c. €116
d. €120

3.
Company LUCAS considers implementing a new project that now (t = 0) requires an investment of €10.000. The expected cash flows before corporate tax (measured in real terms) at the end of year 1 and 2 are €6.000 and €9.000 respectively. The investment of €10.000 is depreciated on a straight-line basis to zero over two years, based on historical cost. The corporate income tax rate is 15,00%. The nominal cost of capital is 20,00%. The expected inflation is 6,00%.

Question: At t = 1, the expected after-tax cash flow in nominal terms is closest to

a. €5.795
b. €6.013
c. €6.072
d. €6.156

4.

Assume a perfect capital market. The management of HOMEBUILD Enterprises considers to invest in project A and/or project B. The projects are expected to produce cash flows as presented in the table below. The management of HOMEBUILD Enterprises pursues shareholder value creation. The projects can be executed only once. The cost of capital of project A is 10,00%, that of B is 12,00%.

Table: Expected cash flows in Euros of project A and project B (× 1 million)

Machine	0	1	2	3
A	-100	80	160	80
B	-120	90	200	90

Question: The management of HOMEBUILD Enterprises should invest:

a. in project A only
b. in project B only
c. in project A and in project B
d. neither in project A nor in project B

5.
Company VU is considering the implementation of project SMART. To start the project, investments are needed at t = 0 only. The economic lifetime of the project is 2 years. The residual value of the investment is €0. There are no taxes. The project is expected to generate a cash flow of €63,00 and €66,15 at the end of year 1 and 2, respectively. The internal rate of return (IRR) of the project is 5,00%.

Question: Which of the following statements is **true**?

a. If the required rate of return of the project is 5%, then the net present value of the project is zero.
b. If the required rate of return of the project is 0%, then the net present value of the project is negative.
c. The investment outlay of this project cannot be determined.
d. The pay-back period of the project is greater than 2 years.

6.
You consider investing in an apartment complex in Hoek van Holland at t = 0. The required investment at t = 0 is €3.800.000. The expected net cash flow at the end of the first year is €260.000 (expected CF_1 = €260.000) and at the end of the second year €300.000 (expected CF_2 = €300.000). After the second year, the cash flow increases by 2,00% annually until infinity (e.g., the expected cash flow at t = 3 is €300.000 × 1,02). The required rate of return is 8,00%.

Question: At t = 0, the *present value* of the expected cash flows from the project is closest to

a. €4,5 million
b. €4,9 million
c. €5,1 million
d. €5,4 million

7.
Assume a perfect capital market. In this market, the following default-risk-free bonds are traded:

Bond	Remaining maturity	Coupon
A	2 years	3,00%
B	3 years	5,00%

The nominal value of both bond A and bond B is €1.000,00. The 1-year spot rate is 3,00% (r_1 = 3,00%), the 2-year spot rate is 4,00% (r_2 = 4,00%) and the 3-year spot rate is 5,00% (r_3 = 5,00%).

Question: Which of the following statements is **false**?

a. The price of bond A is €981
b. The price of bond B is €1.002
c. The forward rate for year 2 ($_1f_2$) is 5%.
d. The yield to maturity of bond B is 5,00%.

8.
Assume a perfect capital market and a flat term structure of interest rates. The one-year spot rate is 3,00%. Bond A has a coupon of 3,00%. Bond B is a zero coupon bond. The remaining maturity of both bond A and bond B is 10 years. The nominal value of each of the bonds is €1.000,00. Assume the two bonds are default-risk-free.

Question: Which of the following statements is **false**?

a. The price of bond A is lower than €1.000,00.
b. The price of bond B is lower than €1.000,00.
c. The duration of bond A is less than 10,00.
d. The modified duration of bond B is less than 10,00.

9.
Assume a perfect capital market. Consider in this market the recently founded company VOLTKINS. VOLTKINS is investing heavily in growth and this is accompanied by start-up losses, and therefore the expected dividend for the next 3 years is €0,00. It is expected that the company will be profitable onward from the fourth year and that it will start paying dividends in that year. The expected dividend at t = 4 is €2,50 per share and is then expected to increase annually by 2,00% per year until infinity (g = 2,00%). The return required by shareholders is 12,00% (r = 12,00%).

Question: At t = 0, the price of a VOLTKINS share immediately after the dividend payment ($P_{ex\ at\ t=0}$) is closest to

a. €16
b. €18
c. €20
d. €22

10.

Assume a perfect market. In this world, consider the shares of company A. Earnings per share at t = 0 (EPS_0) are €5,00. The trailing price-earnings ratio (P_0/EPS_0) of A is 6,00. The return required by the shareholders is 6,00% (r = 6%) and the perpetual growth rate of the dividend is 4,00% (g = 4%). A's payout ratio (k), investment policy and return on new investments (roni) are constant over time.

Question: Which of the following statements is **true**?

a. The expected earnings per share at t = 1 (EPS_1) are €5,00 × (1+g).
a. The expected earnings per share at t = 1 (EPS_1) are €5,00 × (1+r).
b. The payout ratio is 9,5%.
b. The payout ratio is 8,5%.

11.
Consider a world in which the assumptions of the CAPM hold. In this world, in addition to a risk-free investment object F with a return of 2,00%, only the three risky securities A, B and C are traded. The following is known about these securities:

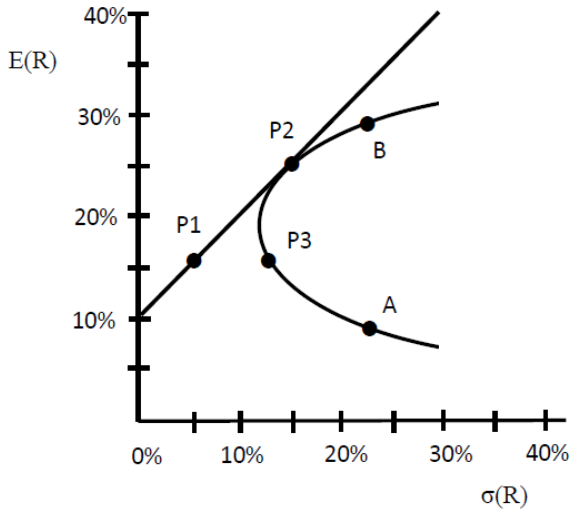
Security i	**A**	**B**	**C**
E(R*i*)	6,00%	10,00%	20,00%
Market value *i* at t = 0	€500.000	€300.000	€200.000
Price per share *i* at t = 0	€10,00	€5,00	€25,00

The risk of the market portfolio (M) expressed as the standard deviation of the return is 21,00% and the expected return of M is 10,00%. Consider rational investor X. Investor X has borrowed €20.000 and invested €60.000 in M.

Question: Which of the following statements is **true**?

a. The expected return of the optimal portfolio of X is 12%.
b. The expected return of the optimal portfolio of X is 16%.
c. The number of shares A in the optimal portfolio of X is 300.
d. The number of shares A in the optimal portfolio of X is 3.000.

12.
Consider a world in which the assumptions of the portfolio theory hold. In this world only two risky securities A and B are traded. Short selling is allowed. It is possible to borrow and lend at the risk-free interest rate of 10% (R_F = 10%). In the figure below, the line that starts at the risk free asset and is tangent to the curve, is the efficient frontier in this world. X_i is defined as the fraction of an investor's wealth invested in security *i*.



Question: Which of the following statements is **true**?

a. P3 is an efficient portfolio.
b. For portfolio P1 it holds that $0 < X_A < 1$ and $0 < X_B < 1$ and $X_F < 0$.
c. For portfolio P3 it holds that $X_A > 0$ and $X_B < 0$.
d. The Sharpe-ratio of portfolio P1 is equal to that of portfolio P2.

13.
Consider a world in which the assumptions of the portfolio theory hold. In this world only the two risky securities A and B are traded. Short selling is allowed. There is no risk-free asset (i.e., it is not possible to borrow or lend). The risk of A measured as the standard deviation of its return is 15% and for B this is 30%. The expected return of A is 20% and of B it is 35%.

Question: Which of the following statements is **false**?

a. If the correlation coefficient between the returns of A and B is 1, it is possible to construct a riskless portfolio by going short in B and long in A.
b. If the correlation coefficient between the returns of A and B is -1, it is possible to construct a riskless portfolio by going long in both A and B.
c. If the correlation coefficient between the returns of A and B is 0, it is possible to construct a riskless portfolio by going short in B and long in A.
d. If the correlation coefficient between the returns of A and B is 1, the risk of a portfolio - measured as the standard deviation of its return - that consists for 50% of A and 50% of B is 22,5%.

14.
Consider a world that satisfies the assumptions of the CAPM. In this world, only three risk-bearing securities are traded, A, B and C, as well as a risk-free security F with a return of 2,00%. The following is known:

Security	**A**	**B**	**C**
$E(R_i)$	6,00%	12,00%	?
$\sigma(R_i)$	20,00%	30,00%	40,00%
β_i	?	1,00	1,50

The risk of the market portfolio is 24,00% ($\sigma(R_M) = 24,00\%$).

Question: Which of the following statements is **true**?

a. The beta of A is 0,4 and the level of unsystematic risk of C is 4%.
b. The beta of A is 0,6 and the level of unsystematic risk of C is 6%.
c. The beta of A is 0,4 and the level of unsystematic risk of C is 6%.
d. The beta of A is 0,6 and the level of unsystematic risk of C is 4%.

15.
Assume a world that satisfies the assumptions of the CAPM. Company NOOR is financed for 60% of its market value with equity (E) and for 40% with interest-bearing debt (D). The beta of equity is 1,5 and that of debt is 0,5. The company has only one type of business and no excess cash. The risk-free interest rate is 2,00% and the market risk premium is 5,00%.

Question: Which of the following statements is **true**?

a. The asset-beta of company NOOR is 1,5.
b. The asset-beta of company NOOR is 0,5.
c. The weighted average cost of capital (WACC) of company NOOR is 10,0%.
d. The weighted average cost of capital (WACC) of company NOOR is 7,5%.

16.

Firm B wants to acquire firm T. The market value of the equity of B as a single entity is €500 million and that of its risky debt is €500 million. The market value of the equity of T as a single entity is €300 million and that of its risky debt is €300 million. The acquisition of T by B is financed through new equity. B issues new shares and exchanges these for all the shares of T. The synergies of the acquisition are €100 million. As a consequence of the acquisition, the risk for the debt holders will decrease. As a result, the market value of the debt of B increases from €500 million to €510 million and that of T from €300 million to €305 million.

Question: The market value of the equity of B after the acquisition of T is closest to

a. €905 million
b. €910 million
c. €885 million
d. €890 million

End of MC questions

Part B: Open ended questions (18 points)

17. (6 points)
Consider a world in which the assumptions of the portfolio theory hold which also include that *short selling* is possible. In this world only two risky securities are traded, security A and B. The following data is known:

	A	B
E(R)	15%	25%
σ(R)	25%	50%

The correlation coefficient between the returns of security A and security B is 0,00.

In this world investor Marie holds a portfolio that consists of long positions in both A and B. X_A is 60% and X_B is 40%, where X_A and X_B are the fractions of Marie's wealth invested in securities A and B, respectively.

Question:

a. Calculate the expected return of the minimum risk portfolio (MRP), i.e. the portfolio with the lowest risk. (2 points)
b. Calculate the expected return of the portfolio of investor Marie. (2 points)
c. Is the portfolio of investor Marie efficient? Explain your answer. (2 points)

18. (6 points)
In week 6 of the course we have discussed the Efficient Market Hypothesis (EMH) of Fama (1970). Fama distinguishes three different forms of the EMH.

Questions

a. Describe the efficiency of the market when the semi-strong form of the EMH holds and explain what the implication of the semi-strong form of the EMH is for investors who try to make abnormal returns. (3 points)
b. Explain how it is possible to earn abnormal returns in a market that is efficient in the weak form but not in the semi-strong form. (3 points)

19. (6 points)
Consider a world that satisfies the assumptions of the CAPM. In this market, bonds issued by company VITTEL are traded. The face value per corporate bond is €1.000,00, the remaining maturity is 1 year and the coupon is 6,00%. In the event of default only €500,00 per bond will be paid to the bondholders at the end of its maturity. Otherwise the payment is equal to the face value plus the coupon. The probability of default is 10,00%. The one-year spot rate (r_1) is 2,00%. The beta of the bonds is 0,50. The expected return of market portfolio M ($E(R_M)$) is 9,00%.

Questions:

a. Calculate the return required by the bondholders of VITTEL. (2 points)
b. Calculate the price of one bond VITTEL. Round your answer to two decimal places and show your calculation. (2 points)
c. Calculate the yield of one bond VITTEL. (2 points)

END