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: 14 December 2023
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 18 January 2024.
Inspection: tba

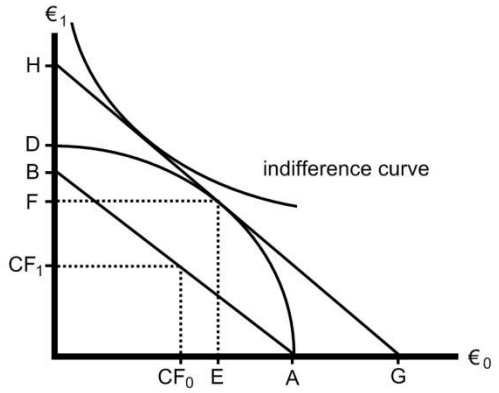
By taking this exam, you confirm that:
- You are the student who should participate in this exam;
- You will make this exam individually, without assistance of others, without using prohibited resources, as stipulated in the exam instructions and the SBE Regulations and Guidelines;
- You will adhere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

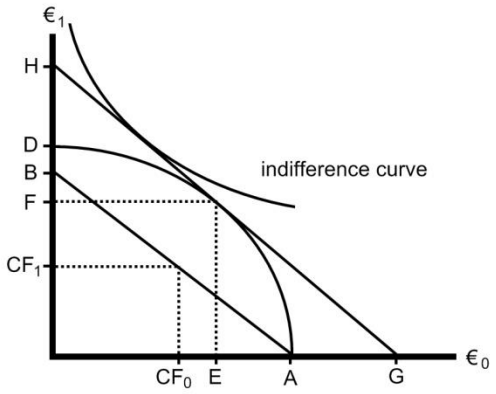
1.
Assume a world according to the Hirshleifer model. The income of Tessa at t = 0 and t = 1 (CF_0 and CF_1) is €104,00 and €208,00 respectively. The risk-free interest rate is 4,00%. At t = 0 Tessa borrows €40,00 and consumes €74,00 (C_0). At t = 1 the proceeds from the real investments are €124,80 (OF). Consider the figure below (not drawn to scale).



Question: The maximum consumption at t = 0 (OG) is closest to

a. €304
b. €340
c. €354
d. €368

2.
Assume a world according to the Hirshleifer model. Bart owns a shop in Doorn from which he earns €310,00 at t = 0 (CF_0) and €208,00 at t = 1 (CF_1). Bart wants to expand and invests €400,00 at t = 0 in a new shop in Groningen. The expected proceeds at t = 1 are €520,00 (OF). At t = 0 Bart consumes €250,00 (C_0). The risk-free interest rate is 4,00%. Consider the figure below (not drawn to scale).



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

a. €360
b. €366
c. €370
d. €374

3.
On December 31, 2022, the number of outstanding shares of ORANGE MACHINES NV was 210 million. The price per share was €15,00. The amount of cash and cash equivalents was €2,50 bn, receivables were €1,5 bn and payables were €3,00 bn. The market value of interest-bearing debt was €5,00 bn.

Question:
On December 31, 2022, the enterprise value of ORANGE MACHINES NV is closest to

a. €3,15 bn
b. €5,65 bn
c. €7,95 bn
d. €8,15 bn

4.
The company GREENARY N.V. is considering the implementation of a new project that now (t = 0) requires an investment in fixed assets of €6.000. The lifespan of the project is 2 years. The expected operational cash flows before corporate tax at the end of year 1 and 2 are €5.000 and €5.000, respectively. The investment of €6.000 is depreciated on a straight-line basis to zero. It is assumed that that the residual value of the machine is €0. The corporate tax rate is 15%. The cost of capital is 6,00%. Ignore inflation.

Question: The net present value of the new project is closest to

a. €1.856
b. €2.298
c. €2.453
d. €2.617

5.
Assume a perfect capital market. SIEGNAMM N.V. intends to open a number of new stores. The table below shows the expected cash flows (in millions of euros) for this project for the next three years.

t	0	1	2	3
Expected cash flow	-40,0	0,0	2,0	4,0

Assume that the expected cash flow from t = 3 will increase annually by 4,00% to infinity. For example, the expected cash flow at t = 4 is €4,0 million × 1,04 and at t = 5 4,0 million × $1,04^2$, etc. The cost of capital is 10,00%. Ignore corporate tax. The net present value of the project is €17 million.

Question: The internal rate of return of the project is closest to

a. 8,26%
b. 10,00%
c. 12,26%
d. 14,26%

6.
Assume a perfect capital market and a flat term structure of interest rates. The one-year spot rate (r_1) is 4,00%. Consider default risk-free bonds A and B. Both bonds have a remaining maturity of 4 years and a face value of €1.000,00. Bond A has a coupon of 3,00% and the coupon of bond B is 5,00%.

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

a. The yield to maturity of bond A is lower than that of B.
b. The yield to maturity of bond A is higher than that of B.
c. The yield to maturity of bond A is equal to that of B.
d. The yield to maturity of bond A can be higher but also lower than that of B.

7.
Assume an efficient capital market. In this world, consider two bonds. Bond A has a coupon of 4,00% and bond B of 10,00%. The maturity of bond A is 1 year and that of bond B is 2 years. The bonds are free of default risk. The price of bond A is €995,00 and the price of bond B is €1.000. The face value of each of the bonds is €1.000.

Question: The one-year spot rate (r_1) is closest to

a. 3,5%
b. 4,5%
c. 5,0%
d. 5,5%

8.
Assume an capital market. The following is known about firm A and firm B:

	A	B
Earnings per share at t = 1	€10,00	€10,00
Growth rate	4,00%	5,00%
Pay-out ratio	30,00%	30,00%

The discount rate applicable to both companies is 10,00%.

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

a. At t = 0 the price per share of B is 1,0 times that of A.
b. At t = 0 the price per share of B is 1,2 times that of A.
c. At t = 0 the price per share of B is 1,4 times that of A.
d. At t = 0 the price per share of B is 1,5 times that of A.

9.
Assume an efficient capital market. Company Elisabeth N.V. is engaged in the operation of playgrounds. The current price per share is €50,00 (P_0 = €50,00) and the expected earnings per share for next year are €4,00 (EPS_1 = €4,00). Elisabeth invests 50% of its earnings in new projects every year, the remainder is paid to shareholders as dividends. Assume a constant return on new investments (roni). Elisabeth is financed entirely with equity and the return required by the equity providers is 12,00%.

Question: The 'roni' of Elisabeth N.V. is closest to

a. 10%
b. 12%
c. 14%
d. 16%

10.
Assume a world that satisfies the assumptions of portfolio theory. In this world, only the two risky investment objects A and B are traded. Short-selling is allowed.

The risk of A expressed as the standard deviation of return ($\sigma(r_A)$) is 20,00%, and that of B ($\sigma(r_B)$) is 30,00%. The expected return of A is 14,00% and that of B is 18,00%. The correlation coefficient between the returns of A and B is 1,00. The risk-free interest rate is 6,00%.

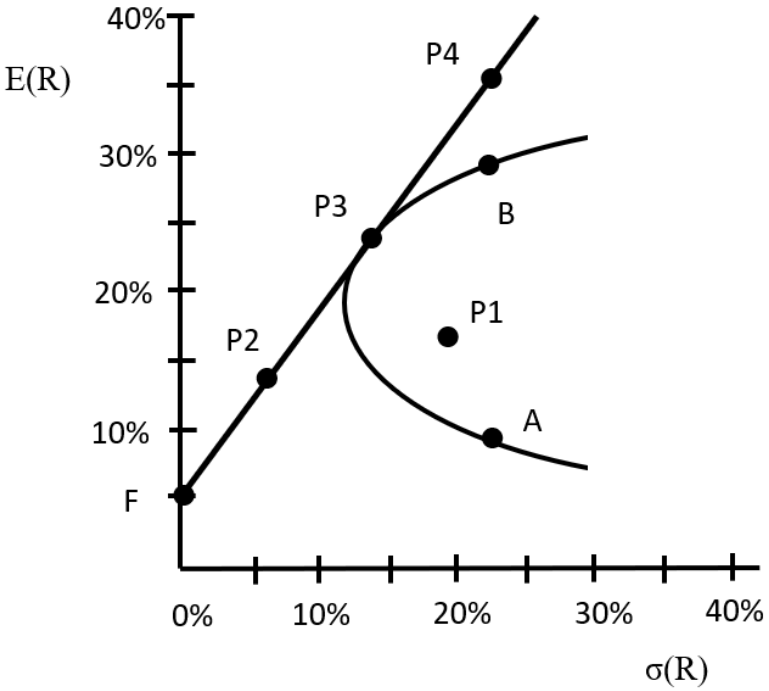
Investor Alex has 50% of his portfolio invested in A and 50% in B.

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

a. Alex's portfolio is inefficient.
b. The expected return of the portfolio of Alex is 24,00%.
c. The risk of Alex's portfolio ($\sigma(r_P)$) is greater than 26,00%.
d. The expected return of the portfolio with the lowest risk (MRP) is 6,00%.

11.

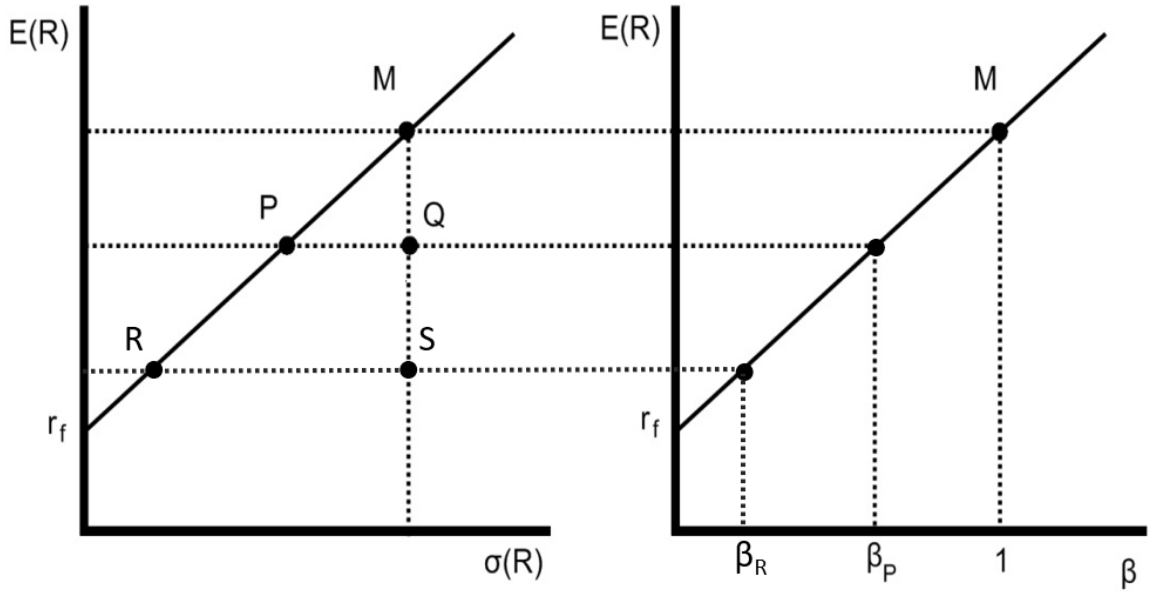
Consider a world in which the assumptions of the portfolio theory hold. In this world only the two securities A and B are traded. Short-selling is allowed. Consider the figure below. It is possible to borrow and lend at the risk-free interest rate of 5%. The line that starts at the risk-free asset and is tangent to the curve through A and B is the efficient frontier in this world. X_A (X_B) is defined as the fraction of an investor's wealth invested in security A (B).



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

a. Portfolio 1 can be formed by borrowing against 5% and going long in both A and B.
b. Portfolio 2 can be formed by going long in both A and B, without lending against 5%.
c. Portfolio 3 can be formed by lending against 5% and going long in both A and B.
d. Portfolio 4 can be formed by lending against 5% and going long in both A and B.

12.
Consider a world in which the assumptions of the CAPM hold. Consider the figure below (which is not drawn to scale), where M is the market portfolio, R and P are efficient portfolios and Q and S are individual securities.



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

a. The level of systematic risk of S is equal to that of Q.
b. The level of systematic risk of Q is equal to that of M.
c. The level of systematic risk of M is zero.
d. The level of systematic risk of Q is greater than that of S.

13.
Consider a world that satisfies the assumptions of the CAPM. The risk-free interest rate is 4,00%. The expected return of the market portfolio M is 10,00%. The total risk of security A measured as the standard deviation of its return (σ_A) is 35%. The unique risk of A is 10%. The total risk of M (σ_M) is 24%.

Question: The expected return of A is closest to

a. 10%
b. 12%
c. 14%
d. 16%

14.
Consider a market in which prices of securities follow a random walk. Assume that each period the probability that the price of security X increases (decreases) is 50% (50%). Price increases of security X each period are 5,00% of the previous price and price decreases are 3,00% of the previous price. At t = 0 the price of security X is €10,00.

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

a. The drift of this random walk is 1,0%.
b. The drift of this random walk is 5,0%.
c. The expected price of security X at t = 1 is €10,25.
d. The expected price of security X at t = 1 is €10,50.

15.
Assume a perfect capital market. The table below shows data for companies B(idder) and T(arget) as independent entities. Both company B and T are exclusively financed with equity. B acquires T. B pays the shareholders of T with new shares. The value of the synergy that is created with the acquisition is €50.000. Directly after the acquisition the shareholders of T hold a stake of 20% in the equity of B.

	B	T
Market value equity	€800.000	€160.000
Earnings per share (EPS)	€5,00	€1,00
Total earnings	€80.000	€40.000

Question: The net present value of the acquisition of T by B for the shareholders of T is closest to

a. €41.000
b. €42.000
c. €43.000
d. €44.000

16.
Assume a perfect capital market. In this world, consider company STAPPEN-Racing Cars N.V. In order to estimate the company's cost of capital, the management of STAPPEN-Racing Cars has estimated the beta of equity and debt for their company. It turned out that the beta of the debt is 0,4 and that the beta of the equity of STAPPEN-Racing Cars is 1,5.

The market value of the debt of STAPPEN-Racing Cars is €50 million and that of its equity is €50 million. STAPPEN-Racing Cars has a significant amount of excess cash and cash equivalents. The value of these risk-free assets is €30 million.

The management applies the CAPM in determining the cost of capital. The risk-free interest rate is 4,00% and the market risk premium is 6,00%. Ignore taxes.

Question: The cost of capital of the risky projects (R_A) is closest to

a. 10%
b. 11%
c. 12%
d. 13%

End of MC questions

Part B: Open ended questions (18 points)

17. (6 points)
Assume a perfect capital market. Consider two corporate bonds in this world. Bond A has a coupon of 6,00% and bond B has no coupon (B is a zero coupon bond). The remaining maturity of both bonds is 1 year. The face value of both bonds is €1.000. The one-year spot rate is 4,00%. The risk premium that investors in bonds A require is 4,00%. The cash flow per bond A that investors in bonds A expect to receive is €1.020,00. The price of bond B is €845,00 and the return investors in bonds B require is 12,00%.

Questions:

a. Determine the price of bond A. Round your answer to two decimals (e.g. €1.234,56) and show your calculations. (2 points)
b. Calculate the cash flow investors in bonds B expect to receive per bond B. Round your answer to two decimals (e.g. €1.234,56) and show your calculations. (2 points)
c. Calculate the yield to maturity of bond B. Round your answer to two decimals (e.g. 12,34%) and show your calculations. (2 points)

18. (6 points)
Consider a world in which the standard assumptions of the CAPM hold. The risk free interest rate is 4,0% (R_F = 4,0%). Furthermore, three risk-bearing securities A, B, and C are traded with the following characteristics:

Security	E(R)	Number of outstanding shares	Current price per share
A	6,00%	31.250	€ 8,00
B	14,00%	25.000	€ 10,00
C	?	25.000	€ 20,00

In this world the wealth of investor Pablo is €40.000. Pablo borrows €10.000 and invests his wealth plus the borrowed amount (in total €50.000) in market portfolio M. The expected return of M is 12,50% and the standard deviation of the return of M is 20,00%.

Questions:

a. Calculate the expected return of security C. Round your answer to two decimals (e.g. 12,34%). You do not have to show your calculations. (2 points)

b. Calculate the expected return of the optimal portfolio of Pablo. Round your answer to two decimals (e.g. 12,34%). You do not have to show your calculations. (2 points)

c. Calculate the expected value of Pablo's wealth at t = 1 in whole euros. You do not have to show your calculations. (2 points)

19. (6 points)
Assume a perfect capital market. Consider project X. The investment outlay at t = 0 is €80,00. The project is expected to generate one cash flow only. This expected cash flow is €121 and expected to be received at t = 2. The asset beta of the project is 1,5. The risk-free interest rate is 4,00% and the expected return of the market portfolio is 8,00%. The required return is 10,00%.

Questions:

a. Calculate the expected EVA at t = 2. Round your answer to two decimals (e.g. €123,45). You do not have to show your calculations. (2 points)

b. Calculate the net present value of the project. Round your answer to two decimals (e.g. €123,45). You do not have to show your calculations (2 points)

c. Calculate the internal rate of return of the project. Round your answer to two decimals (e.g. 12,34%). You do not have to show your calculations. (2 point)

END