Finance
Mid-term exam 2025

The exam lasts 1h30. Written and printed material is authorized. The exam is 10-page long. Explain your answers with precision. Round results to two decimal places.

A. Multiple Choice Questions (8 points)

There are no negative points for false answers. There might be multiple answers.

1. A company has its shares exchanged at 27 euros, pays a dividend of 1 euro, has a return on equity of 10%, a profit margin of 8% and a payout ratio of 20%. This situation is expected to be stable in the future. The company is also repaying every year a bank loan at a rate of 5%.

A. Its cost of capital is 5.7%.
B. Its cost of capital is 5%.
C. Its cost of capital is 11.7%.
D. There is not enough information to compute the cost of capital.

2. Suppose your discount rate is 5%, and can either have €2000 today or get €200 every year, starting today and for the following 9 years (10 payments of €200) growing at a constant rate g. For which value of g are you indifferent between the two projects?

A. 0%
B. 4%
C. 5%
D. 8%

3. These are the financial statements of a company.

	2017	2016
Current assets	$500	$400
Fixed assets, net	700	600
Total assets	1,200	1,000
Current liabilities	300	200
Long-term debt	200	200
Common equity		
Total liabilities and equity	$1,200	$1,000
Net sales	$1,500	$1,200
Total expenses	−1,390	−1,100
Net income	110	100

In 2016,

A. The return on assets is 0.1
B. The return on assets is 1.2
C. The current ratio is 2
D. The current ratio is 1
E. The equity is 600
F. The equity is 800

4. In traditional corporate finance, the objective(s) of the financial manager is to:

A. Maximize the profits of the company.
B. Maximize the value of the stock of the company.
C. Minimize agency costs within the firm.
D. Minimize the level of debt of the company.
E. Maximize Cash-Flows.
F. Maximizing the firm's market share in its industry

5. An interest that is compounded 4 times a year pays

A. More than the same interest compounded annually.
B. Less than the same interest compounded annually.
C. More than the same interest compounded continuously.
D. Less than the same interest compounded continuously.

6. A company can invest in two different robots that serve the same purpose, but have different costs over time. The cost of capital of the company is 5%.

- Robot 1 : 40000 in year 0, 10000 in year 1, 10000 in year 2, 10000 in year 3,
- Robot 2 : 50000 in year 0, 7500 in year 1, 7500 in year 2, 2500 in year 3, 2500 in year 4.

A. The company should invest in Robot 1
B. The company should invest in Robot 2
C. The company is indifferent between investing in Robot 1 or Robot 2.

7. A company is evaluating a project with an NPV of €100000 at a discount rate of 8%. The project has a payment in period 0 and positive cash-flow for the other periods. The project's IRR is 10%. The company has recently upgraded its IT infrastructure, which is expected to improve operational efficiency by 5%. If the company's required rate of return increases to 11%, which of the following is true?

A. Both NPV and IRR will still recommend accepting the project
B. The project should be rejected because the NPV will become negative
C. The project should be accepted based on the IRR alone, since it exceeds the required return.
D. NPV and IRR are unaffected by changes in the required rate of return

8. A manufacturing company purchased a piece of machinery for €100000 five years ago. The machinery has been depreciated to €60000 on the company's balance sheet, but its market value is now €80000. Which of the following correctly describes the current book value and historical value of the asset?

A. The book value is €60000, and the historical value is €100000.
B. The book value is €80000, and the historical value is €60000.
C. The book value is €100000, and the historical value is €60000.
D. The book value is €80000, and the historical value is €100000

B. Exercises (8 points)

Exercise 1 (3 points)

When Alfred Nobel died, he left much of his estate to fund five prizes, each to be awarded annually in perpetuity starting one year after he died.

a. If he wanted the cash award of each of the five prizes to be €72000 and his estate could earn 9% per year, how much would he need to fund his prizes? (1 point)

b. If he wanted the value of each prize to grow by 5% per year (e.g. to keep up with inflation), how much would he need to leave? Assume that the first amount was still €72000. (1 point)

c. His heirs were surprised by his will and fought it. If they had been able to keep the amount of money you calculated in (b), and had invested it at 9% per year, how much would they have in 2025, 129 years after his death? (1 points)

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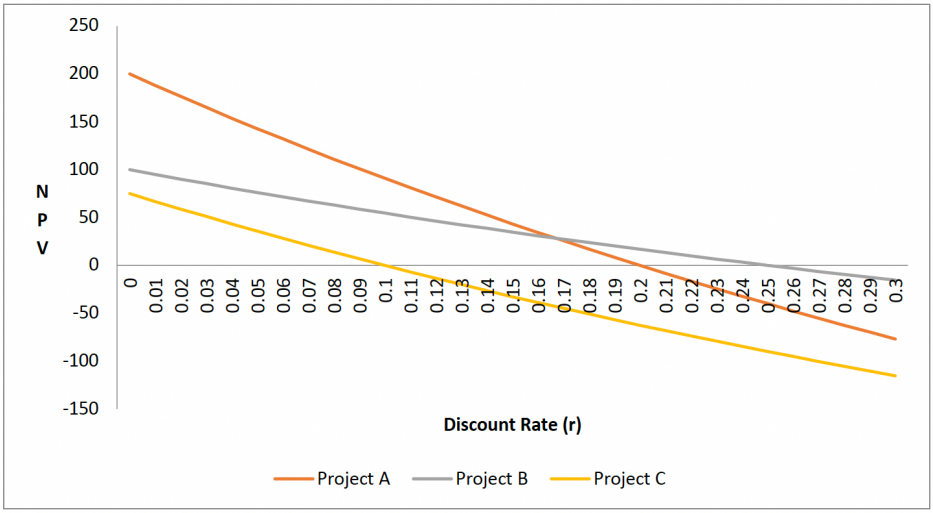
Exercise 2 (3 points)



The chart shows NPV functions for three projects:

a. What is the IRR of each project? (1 point)

b. At a discount rate of 5%, which of the projects would you accept? What about 23%? (0.5 point)

c. Suppose you can only accept a maximum of two projects. At what range of discount rates below 30% would Project C be chosen? (0.5 point)

d. Suppose you can only choose one project – at what range of discount rates would Project B be chosen? (Approximate answers are fine or you could just mention the relevant 'points'.) (0.5 point)

Exercise 3 (2 points)

You want to buy a house in Cergy to live in it next year, and inhabit it for 40 years. You can choose two ways of acquiring the house. The interest rate is 5%.

1. You can buy the house now for €450000
2. You can rent the house for 5 years for a cost of €2500 each month and then buy the house in year 6 at the same cost, €450000.

a. Compute the NPV of each option. Which one should you choose? (1 point)

b. You learn that there are property taxes of €5000 that need to be paid each year when you own the house. Does it affect your choice? Why? (1 point)

C. Problem (5 points)

You want to buy a company. The company is expected to generate, at the end of the year, a cash flow of 1.1 billion in year 1, 2 and 3. The third year an investment of €11.5 billion will be necessary. Following this investment, the company will be able to generate, from period 4, €7.6 billion a year every year, for all time. Your discount rate is 10%.

a. You negotiated a €40 billion deal to buy this company. Should you invest? (1 point)

b. This company has a negative impact on the environment. The government wants to tax the **positive cash flows** generated by the firm, so that investing in the company is less profitable than investing in a company developing green energy whose NPV is 1 billion. At what level should the tax be set? *Hint: The after-tax value of a cash-flow CF taxed at rate t is CF*(1-t).* (1 point)

A first bank (bank 1) offers you a perpetual loan of €40 billion with growing repayments: next year, you will have to repay €1.7 billions, and the repayment will grow at 4.5% every year forever starting year 2.

c. What is the NPV of the debt contract offered by bank 1? [*Hint: the NPV of a debt contract consists in a positive cash flow in period 0 and negative cash flows the following years*] (1 points)

Suppose now that you go to a second bank (bank 2). Bank 2 absolutely wants to be paid back in Year 10 exactly, staring next year. The repayment will also grow at 4.5% every year starting year 2.

d. Which maximum repayment do you need to negotiate to choose bank 2's debt contract over bank 1's debt contract? (1 points)

Unfortunately, you did not manage to negotiate that payment, so you went with bank 1 instead.

e. What is the IRR associated with bank 1's debt contract? (0.5 point)

Suppose now that bank 1 cannot give the €40 billions as one loan. Instead, bank 1 must raise funds from multiple other lenders. It offers multiple smaller sized loans to choose from:

Debt Project	Loan Size	NPV
A	4	6
B	13	6.5
C	7	7
D	13	3.25
E	20	2

f. Given that you have to raise **at least** $40 billions, which debt projects are you going to pick? (0.5 point) *[Hint: Rank products by their profitability ratio.]*