

i General information

Institute of for Health and Society
Department of Health Management and Health Economics
University of Oslo

Exam: HFIN 4210- Finance and Investment

Time: May 23rd, 3:00 PM (3 hours)

Here follows some IMPORTANT information regarding the exam:

There are 15 questions in total generating a maximum of 43 points. All the questions shall be answered. Generally, each correct answer generates 1 point. But, there are some more difficult questions generating 2 points. Unless specifically noted in the question text, a correct answer gives 1 point.

Note about how to answer:

- You can **round off to closest whole number** if your answer has decimals, unless otherwise noted.
- **Only type numbers into numerical answers**, for example if your answer was "\$50,000" you should enter "50000" (no space, commas or \$ signs).

Note also:

Generally, interest payments are made the end of a regular term, typically yearly. **This is in line with what has been the normal assumption throughout the lectures.** We just include this information here for completeness.

Examination support material:

All you answers are to be entered into Inspira. To find your answers, the following supporting materials are allowed to be used during the examination:

- Excel (click here to open: [HFIN4210 exam file](#). Note: This instance also contains a table that you may find helpful when solving question 5 and 6.
- Desmos scientific calculator (inside Inspira)

Note: your Excel file or Desmos calculator calculations will not be saved or used for assessing your exam, nor do we want you to upload files. Only your answers entered into Inspira generate points.

i Formula sheet

Formulas that potentially could become useful

Present value (PV) of annuity (C) for t periods:

$$PV = C \left(\frac{1}{r} - \frac{1}{r(1+r)^t} \right)$$

Forward value (FV) of annuity (C) for t periods:

$$FV = C \left(\frac{(1+r)^t - 1}{r} \right)$$

Present value (PV) of perpetuity (C):

$$PV = \frac{C}{r}$$

Present value (PV) of annuity (C) for t periods growing at rate g:

$$PV = C \left(\frac{1}{r-g} \left[1 - \frac{(1+g)^t}{(1+r)^t} \right] \right)$$

Present value (PV) of perpetuity (C):

$$PV = \frac{C}{r-g}$$

Present value (PV) of break-even lease rate (C) for t periods:

$$PV = C \left(\frac{1}{r} - \frac{1}{r(1+r)^t} \right) * (1+r)$$

Annual effective interest rate (E), for periodic rate i, with n periods per year:

$$E = (1+i)^n - 1$$

The duration of a T-period bond:

$$Duration = \frac{1*PV(C_1)}{PV} + \frac{2*PV(C_2)}{PV} + \frac{3*PV(C_3)}{PV} + \dots + \frac{T*PV(C_T + FaceValue)}{PV}$$

Expected return on assets (according to Miller and Modigliani):

$$r_A = r_D \frac{D}{D+E} + r_E \frac{E}{D+E}$$

Expected return on equity (according to Miller and Modigliani):

$$r_E = r_A + (r_A - r_D) \frac{D}{E}$$

Degree of operating leverage (DOL):

$$DOL = \frac{\% \text{change in profits}}{\% \text{change in sales}} = 1 + \frac{\text{Fixed costs incl. depreciation}}{\text{pretax profits}}$$

Formula for calculating the real rate of return (r_e) is:

$$1 + r_e = (1 + r_{nominal}) / (1 + r_{inflation})$$

Operating profit margin (OPM):

$$OPM = \frac{\text{net income} + \text{after-tax interest paid}}{\text{sales}}$$

Asset turnover ratio (ATR):

$$ATR = \frac{\text{sales}}{\text{assets at the start of the year}}$$

Return on assets (ROA):

$$ROA = \frac{\text{net income} + \text{after-tax interest paid}}{\text{assets at the start of the year}}$$

1) About Corporate Finance

Please answer the following questions. Each correct answer generates 1 point. Wrong answers give 0 points.

a) Which of the following is an example of a financing decision, not an investment decision?

Choose an alternative:

- ☐ Deciding to invest in new x-ray machine.
- ☐ Launching a marketing campaign for a new product.
- ☐ Accepting capital from a venture capital firm in exchange for equity. ✓
- ☐ Redesigning a product to reduce production costs.

b) According to the Fisher separation theorem, which problem can the financial manager help its shareholders solve?

Choose an alternative:

- ☐ Maximize their net value. ✓
- ☐ Optimize consumption timing.
- ☐ Optimize risk exposure.
- ☐ Maximize utility.
- ☐ Minimize risk.

c) Which of the following best explains why a firm should only invest in projects with an expected return greater than the opportunity cost of capital?

Choose an alternative:

- ☐ Investing in projects with higher returns than the opportunity cost of capital increases shareholder value. ✓
- ☐ Projects with higher returns increase employee salaries and reduce risk.
- ☐ The opportunity cost of capital is a fixed percentage, so any return above it guarantees profits.
- ☐ The opportunity cost of capital is irrelevant if the project is funded internally rather than through financial markets.

Maks poeng: 3

2) Present and future values

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

a) You invest 1000 today with an interest rate of 7% per year, added at the end of each year. What is the interest payment you receive at the end of year 5? Write your answer here: (91 - 92)

b) You own an asset which 10 years from now will give a payment of 22 456. Someone offers you 10 000 today for this asset. What discount rate would you need for you to be indifferent between these options, i.e., a NPV = 0? Write your answer here (percent number, e.g. "20" if your answer is 20%): (8 - 9) .

c) You own an asset which 10 years from now will give a payment of 34 111. Your discount rate is 7%. What is the lowest amount you would be willing to sell the asset for, for you to be indifferent between these options, i.e., a NPV = 0? Write your answer here: (17340 - 17341) .

d) An X-ray machine is expected to give an annual income of 100 000 into perpetuity, first payment one year from now. The cost of capital is 4%. What is the net present value (NPV) of this machine. Write your answer here: (2500000) .

e) What if the X-ray machine rather had its first 100 000 payment today? What is now the net present value (NPV) of this investment? Write your answer here: (2600000) .

f) 18 years from now you want to buy a house that costs 1 000 000. The interest rate is 5%. How much do you need to put aside at the end of every year, starting 1 year from now, to reach the goal? Write your answer here: (35545 - 35547) .

Maks poeng: 6

3) Effective interest rates

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

a) A consumer loan has a 4% monthly interest rate, what is the effective annual interest? Write your answer here (only percent number, e.g. write "20" if your answer is 20%): (60)

b) A loan has a 20% annual effective interest rate. The payments are quarterly, what is then the quarterly interest rate? Write your answer here (only percent number, with one decimal point, e.g., write "20.2" if your answer is 20.2%): (4.6 - 4.7)

Maks poeng: 2

4) Net present value 2: Applications

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

a) You own a stock that you plan to sell 11 years from now. You expect to be able to sell it then (11 years from now) for 180. Someone offer you 120 for the stock today. Assuming yearly fixed dividend payments, first payment one year from now (last payment right before selling the stock, i.e., 11 dividend payments), what dividend payment would make you indifferent to the 120 offer (NPV = 0) if the discount rate is 8%? Write your answer here: (5 - 7) .

b) A 5-year bond has an annual 3% coupon rate and a face value of \$100 (first payment one year from now). The yield to maturity is 5% (discount rate). What is the price of the bond? (91 - 92)

c) What is the duration of the bond described in (b)? Write your answer here with one decimal point (either using comma or dot): (4.6 - 4.8)

Maks poeng: 3

5 5) Net present value applications: Bonds

a) When interest rates suddenly increase, the prices of bonds usually...

Choose one alternative:

- ☐ Could increase or decrease
- ☐ Decrease
- ☐ Are unchanged
- ☐ Increase



b) Which statement is true?

Choose one alternative:

- ☐ Generally, bonds with lower coupon payments are less sensitive to interest rate changes.
- ☐ Generally, bonds without coupon payments are not sensitive to interest rate changes.
- ☐ Generally, bonds with shorter duration are less sensitive to interest rate changes. ✓
- ☐ Generally, bonds with longer duration are less sensitive to interest rate changes.

Maks poeng: 2

6) Investment criterias and decisions

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

Consider the following projects:

	year 0	year 1	year 2	year 3	year 4
Project A	-125	0	0	0	200
Project B	-800	500	200	200	50

a) What is the internal rate of return on project A? Write your answer here (percentage, e.g. "8" if you answer is 8%): (12 - 13)

b) Which of these is closest to the internal rate of return (IRR) of project B: 5%, 10%, 15%, 20%, 25% or 30%? Please write the number here (just the number, not "%"): (10)

Maks poeng: 2

7) Investment criterias and decisions 2

Which of the the following statements is NOT true about using the internal rate of return (IRR) to choose between projects?

Choose an alternative

- ☐ There can be multiple IRRs
- ☐ The IRR accounts for the time value of money
- ☐ The IRR ignores the magnitude of projects
- ☐ The IRR does not distinguish between lending and borrowing
- ☐ The IRR is higher than the opportunity cost of capital
- ☐ IRR is the same as the opportunity cost of capital



Maks poeng: 1

8) Project analysis part 1

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

Medtech solutions is considering a project to produce and market new medical gadgets. The most likely outcomes of the project are as follows:

1. Expected sales: 1000 units per year
2. Expected unit price: \$2000
3. Variable cost per unit: \$500
4. Payable fixed production costs: \$500,000 per year

The project will last for 4 years (years 1 to 4) and requires an initial investment of \$3 million (in year 0). The investment will be depreciated straight-line over the project life (linearly) to a final value of \$1 million, at which it will be sold in year 5.

The required rate of return is 8%. **The company is paying no taxes.**

Note: Use minus if your answer in any of questions below is a negative amount. For example, a negative cash flow of 30 should be written "-30".

a) What is the net income (also sometimes called profit or bottom line) in year 1? (There is no debt cost to consider). Write your answer here:

 (500000)

b) What is the project's cash flow (EBITDA) in year 1? Write your answer here:

 (1000000)

c) What is the project's NPV? Write your answer here:

 (992709 - 992711)

d) Assume now in addition that the company wants 10% of revenues in each year as working capital, available at the start of the year, what is the cash flow in year 1? Write your answer here:

 (1000000)

e) And, as a continuation of (d) - the company wants 10% of revenues in each year as working capital, available at the start of the year - what is the cash flow in year 0? Write your answer here:

 (-3200000)

f) And, as a continuation of (d) - the company wants 10% of revenues in each year as working capital, available at the start of the year - what is the cash flow in year 5 (year after the project ends)? Write your answer here:

 (1200000)

9) Project analysis part 2

This question is a continuation of the case in the previous question.

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

Same information: Medtech solutions is considering a project to produce and market new medical gadgets. The most likely outcomes of the project are as follows:

1. Expected sales: 1000 units per year
2. Expected unit price: \$2000
3. Variable cost per unit: \$500
4. Payable fixed production costs: \$500,000 per year

The project will last for 4 years (years 1 to 4) and requires an initial investment of \$3 million (in year 0). The investment will be depreciated straight-line over the project life (linearly) to a final value of \$1 million, at which it will be sold in year 5.

The required rate of return is 8%. **The company is paying no taxes.**

New information: However, the project manager has recognized that some of these estimates are subject to error. She has therefore asked you to perform some extra analysis to explore the level of risk.

a) How much must expected sales fall (in percent) before the project is break-even in terms of net income in year 1? Write your answer here (percent number, e.g. write "20" if your answer is a fall of 20%):

(32 - 33)

b) How much can unit prices fall (in percent) before the cash flow is break-even in year 1? Write your answer here (percent number, e.g. "20" if your answer is a fall of 20%):

(50) .

Maks poeng: 2

10) Debt policy

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

A company is financed with 25% equity, valued at 250 000, and 75% debt, valued at 750 000. The cost of debt is 4% and the expected cost of equity is 12%. Now the company reduces its debt to 500 000 by selling shares it owns.

a) How many percent of the firm's value will be debt after the capital restructuring? Write your answer here (only percent number, e.g. write "20" if your answer is 20%): (50) .

b) After restructuring the cost of debt reduces to 3%, what is the expected return on equity according to Miller and Modigliani (proposition 2)? Write your answer here (only percentage number, not the "%"): (9) .

Maks poeng: 2

11) Debt policy 2

Note: In this question you can choose one or multiple options. You get 1 point per correct answer, -1 for wrong answers, and a minimum of 0 per question.

a) Which of the following statements are true, according to Miller and Modigliani's theorem (in a world without tax)?

Choose one or more options:

- ☐ The return on assets normally increases in debt level.
- ☐ The return on equity normally increases in debt level. ✓
- ☐ The return on equity and return on assets are the same when debt level is zero. ✓
- ☐ Firm value is maximized at a specific debt-to-equity ratio.
- ☐ When return on assets and cost of debt are the same, return on equity is the same as return on debt. ✓

b) Which of the following statements are true, when assuming a real-world with tax and imperfections in financial markets?

Choose one or more options:

- ☐ Firm value is maximized when debt is maximized.
- ☐ More profitable firms have more debt.
- ☐ Firms with more tangible assets have more debt. ✓
- ☐ Smaller firms have more debt.
- ☐ Tax shields on interest rate payments increase firm value. ✓

Maks poeng: 5

12) Leasing part 1

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

You are considering buying or leasing an operation robot. It costs 2000 and is expected to last for 10 years, and depreciated linearly over the 10-year horizon (value of 0 after 10 years). The yearly maintenance cost is 100 (charged at the end of each of the 10 years).

a) What is the cash flow in year 3 if you buy the robot, if there are no taxes? Write your answer here (use minus if a negative cash flow, e.g., "-30"): (-100)

b) What is the cash flow in year 3 if you buy the robot and there is a 25% tax? Write your answer here (use minus if a negative cash flow, e.g., "-30"): (-25)

c) Assuming no tax, what is the lowest leasing rate - paid upfront each year for 10 years - you would accept, assume 6% discount rate? (349 - 351)

Maks poeng: 3

13) Leasing part 2

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

This question is a continuation of the case in the previous question, expect for the question, the information is identical to the previous question. **This question generate 2 points for a correct answer.**

Same information: You are considering buying or leasing an operation robot. It costs 2000 and is expected to last for 10 years, and depreciated linearly over the 10-year horizon (value of 0 after 10 years). The yearly maintenance cost is 100 (charged at the end of each of the 10 years).

Tax rate is 25%, and pre-tax cost of capital is 6%.

Question: What is the annual break-even lease payment before tax ? Write your answer here:

(353 - 358) .

Maks poeng: 2

14) The timing of investment

Reminder: All answers should be without spaces or symbols - round off to nearest whole number, unless otherwise noted.

This question generate 2 points per correct answer.

Your clinic needs to have an x-ray machine available in the foreseeable future.

You have been offered to buy an x-ray machine (machine 1) that costs 1000 (investment in year 0), lasts for 8 years, and gives a yearly income of 800 (8 times, first time one year from now). An alternative provider has a machine that lasts for 5 years (machine 2), costs 800. What is the yearly income from from this machine (machine 2) that would make you indifferent between

these two options when your discount rate is 6%? Write your answer here: (827 - 831).

Maks poeng: 2

15) Principal agency problems

a) Which of the following is NOT typically considered a type of agency problem in corporate finance?

Choose on option:

- ☐ Managers pursuing growth at the expense of firm value
- ☐ Avoidance of value increasing risk-taking
- ☐ Managers buying expensive things on corporate accounts
- ☐ Shareholder activism



b) What is a typical measure taken to limit agency costs related to a CEO?

Choose one alternative:

- ☐ Compensation schemes that are tied to sector performance.
- ☐ Fixed compensation levels, that limits risk.
- ☐ Compensation schemes that rewards firm growth.
- ☐ Compensation schemes that rewards company stock performance.



Maks poeng: 2