

School of Business

## WRITTEN EXAMINATION

Course Corporate Finance Management

Sub-course

Course code FÖ338G

Credits for written examination 7,5

Date 2024-02-02

Examination time 08.15-12.30

Examination responsible Hans Mörner

Teachers concerned Hans Mörner, Joachim Samuelsson

Aid at the exam/appendices

Your calculator

Other

Instructions

- ☐ Take a new sheet of paper for each teacher.
- ☐ Take a new sheet of paper when starting a new question.
- ☒ Write only on one side of the paper.
- ☒ Write your name and personal ID No. on all pages you hand in.
- ☒ Use page numbering.
- ☒ Don't use a red pen.
- ☒ Mark answered questions with a cross on the cover sheet.

Grade points

A	55-60	B	49-54
C	43-48	D	37-42
E	30-36	F	0-29

**Examination results should be made public within 18 working days**

*Good luck!*

**Question 1**

15 marks

- a) Explain what we mean about compound interest.
- b) What is the difference between a call option and a put option?
- c) What is the Security Market Line?
- d) What is it meant by opportunity cost of capital?
- e) What happens at the ex-dividend date?

**Question 2**

15 marks

- a) What is the difference between nominal interest rate and real interest rate?
- b) Mr. Art Deco will be paid \$100,000 one year ahead. The nominal discount rate is 8 percent. The inflation rate is 4%.

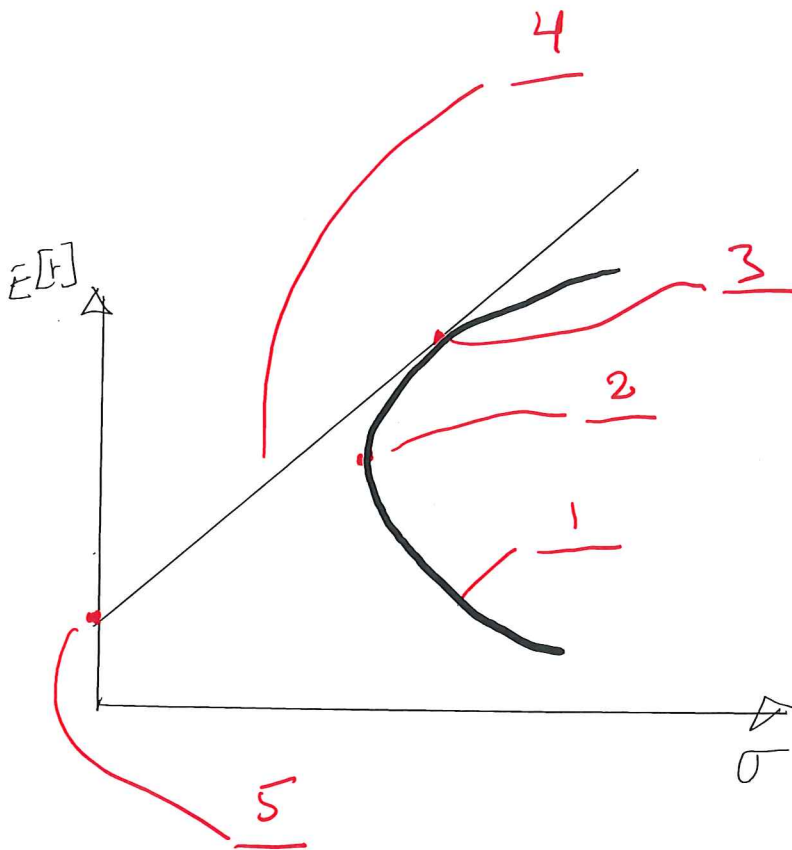
Calculate the PV of Mr. Deco's payment using the equivalent real cash flow. You start your calculation by adjusting for inflation. Then you calculate the real discount rate and calculate the present value in real terms.

- c) What do we mean by sunk cost.

**Question 3**

15 marks

- a) In portfolio theory you talk about efficient frontier. What is that?
- b) In the figure below, you can see five red lines. They indicate a specific line or a dot. Give their names and the meaning of them.
- c) What determines the curvature of the line number 1 points at?



#### Question 4

15 marks

The stock of a firm is currently traded at SEK 36 per share there are 25 million shares outstanding. The firm has a perpetual debt outstanding with a market value of SEK 600 million and a yield of 6%. The risk-free rate is 6% and the market premium is 8%. The stock has a beta of 1.75. The corporate tax rate is 35%.

- What is the cost of equity for the firm?  
CAPM can be used.
- The firm is considering a scale-enhancing project. The firm will maintain the present capital structure. What discount rate should the firm use?
- The project requires an outlay of SEK 1.5 million and generate an after-tax income of SEK 280,000 in perpetuity. What is the net present value of the project?

## Formulas

The rate of return of an asset during the period from t to t+1

$$r = \frac{P_{t+1} - P_t}{P_t}$$

Effective interest rate  $\left(1 + \frac{r}{m}\right)^m - 1$

Where m is the number of pay-outs of the interest rate during the period and r is the interest rate.

### Present value and future value discretely compounded

Future value  $FV = C_0(1 + r)^T$

Present value  $PV = \frac{C_1}{(1+r)^T}$

Net present value for an investment that lasts for one period

$$NPV = -C_0 + \frac{C_1}{1+r}$$

### Present value and future value continuous compounded

Continuous paid interest rate

Future value  $FV = C_0 * e^{rT}$

Present value  $PV = C_T * e^{-rT}$

C is the amount

### Bond valuation

C = coupon

N = The face value.

T = Time to maturity

r = Risk adjusted discount rate.

$$P = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^T} + \frac{N}{(1+r)^T}$$

Zero coupon bond

$$P = \frac{N}{(1+r)^T}$$

Perpetuity

The present value of an amount paid in perpetuity.



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

If we have a constant growth from next periods amount.

$$PV = \frac{C_1}{r - g}$$

**Present value of an annuity.**

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

Present value of an annuity that lasts forever but starts at T years from now.

$$PV = \frac{C}{r} * \frac{1}{1 + r^T}$$

When the annuity increases with g.

$$PV = C_1 \left[ \frac{1}{r - g} - \frac{1}{r - g} * \left( \frac{1 + g}{1 + r} \right)^T \right]$$

## Statistics

Average value.

$$Mean = \bar{R} = \frac{(R_1 + R_2 + R_T)}{T}$$

Variances

sample

$$Var = \frac{1}{N - 1} [(R_1 - \bar{R})^2 + (R_2 - \bar{R})^2 + \dots + (R_T - \bar{R})^2]$$

Covariances

$$Cov(R_A, R_B) = E(R_A - \bar{R}_A) * (R_B - \bar{R}_B)$$

Correlation

$$\rho_{AB} = \text{Corr}(R_A, R_B) = \frac{\text{Cov}(R_A, R_B)}{\sigma_A * \sigma_B}$$

### Stock valuation

Expected return of a stock

$$\text{Expected\_Return} = r = \frac{\text{Div}_1 + P_1 - P_0}{P_0}$$

### Stock price earnings per share and investment

Stock price

$$p_0 = \frac{\text{Div}_1}{r} = \frac{\text{EPS}_1}{r}$$

Div = Dividend

P = Price

For a constant growing firm

$$P = \frac{\text{Div}_1}{r - g}$$

$\text{Div}_1$  = dividend in a year from now.

In case we calculate the investment as side effect and earnings equals dividend.

$$p_0 = \frac{\text{EPS}_1}{r} + \text{PVGO}$$

In case there is a growth in the earnings per share.

$$p_0 = \frac{\text{EPS}_1}{r - g} + \text{PVGO}$$

$$\frac{\text{Price per share}}{\text{EPS}} = \frac{1}{r} + \frac{\text{PVGO}}{\text{EPS}}$$

$$\frac{\text{Price}}{\text{Earnings}} = \frac{1}{r} + \frac{\text{PVGO}}{\text{EPS}}$$

$$\text{Plowback ratio} = 1 - \text{payout ratio} = 1 - \frac{\text{DIV}}{\text{EPS}}$$

Where does r comes from

$$r = \frac{\text{Div}_1}{P_0} + g$$

Book value of return

$$\text{Book value of return} = \frac{\text{Book income}}{\text{Book assets}}$$

*Earnings per share*

$$\text{EPS} = \frac{\text{Earnings}}{\text{Total number of Shares}}$$

$$\text{Shares} = \frac{\text{Total firm value}}{\text{Price per share}}$$

## Portfolio

**Valuation of a portfolio with two risky assets.**

The risk as variance

$$\sigma_p^2 = x_a^2 \sigma_a^2 + x_b^2 \sigma_b^2 + 2x_a x_b \rho_{ab} \sigma_a \sigma_b$$

Expected return

$$E[r_p] = x_a r_a + x_b r_b$$

$x$  = the portfolio weight

$\sigma$  = the standard deviation

$\rho$  = the correlation

The slope of the Security Market line is:  $\text{Sharpe\_Ratio} = \frac{\text{Risk\_premium}}{\text{Std\_dev}} = \frac{r - r_f}{\sigma}$

Expected risk premium

$$r - r_f = \beta(r_m - r_f)$$

Market return

$$r_m = r_f + \text{Risk\_premium}$$

Risk premium on individual security

$$E(r_i) - r_f = \frac{\text{Cov}(r_i, r_M)}{\sigma_M^2} [E(r_M) - r_f] = \beta [E(r_M) - r_f]$$

**Risk and cost of capital**

CAPM 
$$r = r_f + \beta * (r_m - r_f)$$

After tax WACC

$$WACC = (1 - T_c) * r_D * \frac{D}{V} + r_E * \frac{E}{V}$$

$$R^2 = \frac{\beta^2 \sigma_M^2}{\sigma^2} = \frac{\text{Explained\_var i ance}}{\text{Total\_var i ance}}$$

**Duration**

How long time does it take to get your money back?

Start by calculating the value of the bond

$$P = \frac{C}{1+r} + \frac{C}{(1+r)^2} + \dots + \frac{C}{(1+r)^T} + \frac{N}{(1+r)^T}$$

$$D = \frac{t_1 * \frac{C}{1+r} + t_2 * \frac{C}{(1+r)^2} + \dots + t_T * \frac{C}{(1+r)^T} + t_T * \frac{N}{(1+r)^T}}{P}$$

P is the value of the bond and t is the time.

To calculate the change of the price of a bond when the yield changes. You need the modified duration.

$$D^* = \frac{D}{1+r}$$

Then you can calculate the change of the price of the bond. The price of the bond is called B

$$\Delta B = -BD^* \Delta r$$

### **Inflation**

An approximation

$$r \approx R - i$$

An exact formula

$$r = \frac{R - i}{1 + i}$$

### **Cost of capital and firm value**

$$r_S = r_o + (B/S_L) * (r_o - r_B)$$

$$V_L = V_u + T_C * B$$