

## Allgemeine Klausurtipps

Definitionen ziemlich direkt auswendig lernen. - Supply Chain - Supply Chain Management - Focal Company

Net-Present-Value: Zu einfach, um in der Klausur dran zu kommen

## Formelsammlung

?

## Vorwort

Im Folgenden aufgabenweise die Übungen, zum Bearbeitenden nützliche Informationen und Lösungen.

## Produktion

## Investition / Finanzierung

### Exercise 1 (1-A2)

What are the three main types of decision a financial manager can make? For each decision, give a relevant example.

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Joint Venture between Chrysler and Fiat:

- Investment: to assess the viability of the joint venture
- Finance: How to fund the joint venture
- Liquidity: management (?)

### Exercise 2 (1-A3)

Evaluate the following statement: "Managers should not focus on the current share price because doing so will lead to an overemphasis on short-term profits at the expense of long-term profits."

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- this has always been a criticism of company managers have focused on maximizing share prices because it was linked to their personal remuneration example crunch of 2008
- Some of the banks which were hardest hit had the best share price returns in the years

### Exercise 3 (1A6)

Many companies view a stock market listing as an important objective.

- a) Why do you think this is the case?
  - b) Why do you think Google listed on a stock exchange?
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a)

- the financial markets are one of several avenues through which companies can access funding
- the financial markets are massive
- cheap source of capital

b)

- Google listed on the stock market because it needed extensive funding at an acceptable price level

### Exercise 4 (1-A7)

The 2007 annual report for Anglo American plc, the world's leading global mining company, shows that the firm had € 34.042 billion in non-current assets and €9.962 billion in current assets. It reported € 11.480 billion in current liabilities and € 8.665 billion in non-current liabilities. How much has the equity of Anglo American plc worth?

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Equity = Total Assets - Total Liabilities = (9.662 + 34.0442) - (11.480 + 8.665) = 23.859 billion

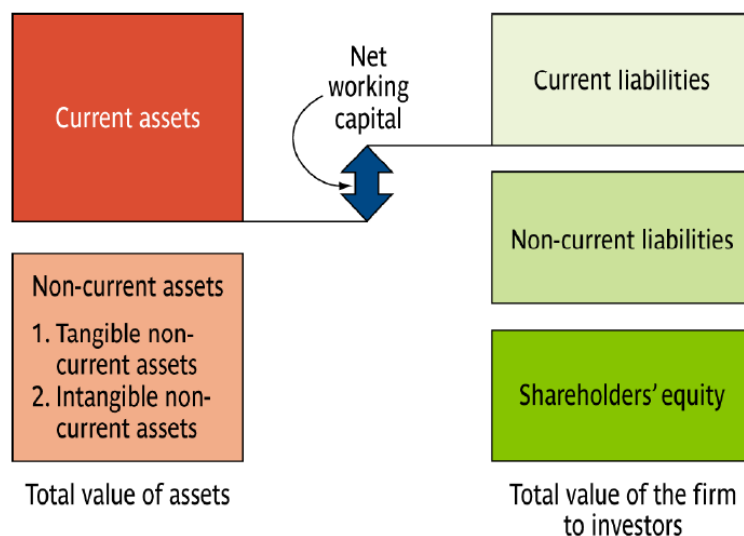


Abbildung 1: Bilanzübersicht

### Exercise 5 (1-A8)

Anlgo American plc announces that it plans to increase its non-current assets by € 10 billion. If the company wishes to maintain its ratio of total liabilities to equity, how much long-term debt should it use?

- Step 1: Determine liability/equity ratio:  
 $\text{Liability} / \text{Equity} = 20.145 / 23.856 = 0.844$
- Step 2: To find the current weightings of debt and equity in the new funding, you must actually calculate a new ratio, liability/assets:  
 $\text{Liability} / \text{total assets} = 20.145 / 44.004 = 0,457799$
- Step 3: The debt raised is thus:  
 $4.5779 \text{ billion and equity is } 5.4200 \text{ billion} = 10 \text{ billion}$
- Step 4: Check the new liability/equity ratio  
 $\text{new level of liabilities} = 24.7229 \text{ billion new level of equity} = € 29.2810 \text{ billion}$
- The new ratio is:  $€ 24.7229 \text{ billion} / 29.2810 \text{ billion} = 0,844$  - the same as before

### Exercise 6 (1-A10)

Your company has just purchased a forklift truck, and has two payment options:

- (a) pay 10,00 Swedish kroner every month for 12 months
- (b) pay 1.200.000 swedish kroner at the end of the year

Which option would you choose? Why?

	Annuity	PV(CF)	One Payment	PV(CF)
1	100000	99009.9		
2	100000	98029.6		
3	100000	97059.01		
4	100000	96098.03		
5	100000	95146.57		
6	100000	94204.52		
7	100000	93271.81		
8	100000	92348.32		
9	100000	91433.98		
10	100000	90528.70		
11	100000	89632.37		
12	100000	88744.92	1200000	1064939.07
<b>PV</b>		<b>1125508</b>	<b>PV</b>	<b>1064939.07</b>

Abbildung 2: Payment options

The payment of SEK 1,200.000 in 12 months is less because the cash flow is after the majority of SEK 100,000 monthly payments (Assume the monthly interest rate is 1 percent)

### Exercise 7 - assessing the viability of two projects (1-A11)

ProjectA Has

- a 25 % chance of losing 1,000,000,
- a 50 % chance of break even and
- a 25 % chance of making 1,000,000 profit

ProjectB Has

- a 25 % chance of losing 2,000,000,
- a 50 % chance of breaking even and
- a 25 % chance of making 2,000,000 profit

Which project should you choose? Why?

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ZWEIFELHAFT, da Projekte in der Zukunft liegen.

You would choose the less risky project because both have the same expected value. In this case you would choose projectA because the risk of losing and gaining money is less than in project b.

### Exercise 8 (1-A14)

You suddenly own a company that is losing € 100.000 per week. At the rate things are going the company won't have any cash left in six months to pay creditors.

What are your goals as a financial manager? Is this consistent with what you have read in this chapter? Explain!

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Goals:

- Balance between the short and long term objectives.
- When the company is in trouble short term liquidity becomes more important.
- the objective of the firm will change from maximizing shareholders value to firm survival and bankruptcy avoidance
- other options such as asset sell-off can also be undertaken

### Exercise 9 (1-A21)

You have the following information for the British mining firm Antofagasta plc. All figures are in € millions.

Give a brief interpretation of what you think Antofagasta plc did over the period 2003–2007. Do you think it is in a better position now than in 2003?

- \_\_\_\_\_
- A lot of current assets in relation to its current liabilities and non-current assets
  - further investigation would be needed to determine what is driving the increase in current assets
  - it looks as if the firm is less risky
  - Current assets could compromise cash

	Dec 31 2007	Dec 31 2006	Dec 31 2005	Dec 31 2004	Dec 31 2003
Total Current Assets (Betriebsmittel)	2,911	2,451	1,849	1,302	452
Total Non-Current Assets (Sachanlagen)	2,945	2,634	1,931	1,897	1,954
<b>Total Assets</b>	<b>5,856</b>	<b>5,085</b>	<b>3,780</b>	<b>3,199</b>	<b>2,406</b>
Total Current Liabilities (kurzfristige Verbl.)	367	514	389	405	309
Total Non-Current Liabilities (langfr. Verbl.)	1,424	1,416	1,349	1,328	1,191
Total Liabilities	1,791	1,930	1,738	1,733	1,500
Total Equity	4,065	3,155	2,042	1,466	906
<b>Total Liabilities &amp; Shareholders' Equity</b>	<b>5,856</b>	<b>5,085</b>	<b>3,780</b>	<b>3,199</b>	<b>2,406</b>
Total Assets/Total Liabilities	3.269682	2.634715	2.174914	1.845932	1.604
Total Current Assets/Total Non-Current Assets	0.988455	0.930524	0.957535	0.686347	0.23132
Total Current Liabilities/Total Non-Current Liabilities	0.257725	0.362994	0.288362	0.30497	0.259446
Total Current Assets/Total Current Liabilities	7.93188	4.768482	4.753213	3.214815	1.462783

Abbildung 3: Liabilities

### Exercise 10 (2-A5)

Explain why the corporate governance of a firm sole proprietorship should be different from that for a partnership, which in turn should be different from a limited corporation.

- A sole proprietorship does not need formal governance structures since all
  - business activities are concentrated on one individual
  - in partnership semiformal corp gov structs are present such as a partnership agreement or deed
  - a limited corporation is a separate legal entity and needs corporate gov structs

### Exercise 11 (2-A6)

What are the differences between a general partnership and a limited partnership? Why do firms choose to be partnerships instead of limited liability corporations?

- In a general partnership all partners agree to provide some fraction of the work and cash and to share the profits and losses.
- Each partner is liable for all of the debts of the partnership. Limited partnerships permit some of the partners to have limited liability (liable only to the amount of cash one has contributed to the partnership).
- Limited partnerships usually require that
  - (1) at least one partner be a general partner and
  - (2) the limited partners do not participate in managing the business.

### Exercise 12 (2-A19)

Why would we expect managers of a corporation to pursue the objectives of shareholders? What about bondholders?

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- In agency theory, the underlying contract between the principal (shareholders) and agent (management) is based on maximising the principal's wealth.
  - We would expect managers to pursue the objectives of shareholders only if their interests are the same as that of the shareholders.
  - This can be done through appropriate executive compensation contracts. In most situations, the shareholder and bondholder objectives will be the same.
  - However, when a firm is in financial distress, these may differ and then shareholder objectives will naturally take precedence. This is why we have bond indentures.

### Exercise 13 - Valuation: The One-Period Case (4-A1)

Would you be willing to pay € 500 today in exchange for € 525 in one year? What would be the key considerations in answering yes or no? Would your answer depend on who is making the promise to repay?

### Exercise 14 - Compounding Periods (4-A3)

As you increase the length of time involved, what happens to future values? What happens to present values? What happens to the future value of an annuity if you increase the rate  $r$ ? What happens to the present value?

### Exercise 15 - Calculating Future Values (4-A7)

In the UK, every child born after 1 September 2002 receives a € 250 voucher from the government that they cannot touch until they reach the age of 18. Assume that the growth rate of the funds is 3.5 per cent (this is what the British government suggests):

How much will your child have at the age of 18?

### Exercise 16 - Calculating present values (4-A8)

In 2008, British Airways had a pension liability of € 330 million.

Let's assume it must be paid in 30 years' time.

To assess the value of the firm's shares, financial analysts want to discount this liability back to the present.

If the relevant discount rate is 5.6 per cent, what is the present value of this liability?

### Exercise 17 - Calculating Rates of Return (4-A9)

On 8 February 2009 John Majeski, chairman of Reading Football Club, sold the Edgar Degas bronze sculpture *Petite Danseuse de Quatorze Ans* at auction for a world record price of € 13.3 million.

He bought the statue in 2004 for € 5 million. What was his annual rate of return on this sculpture?

### Exercise 18 - Interest (4-A6)

You work for a jewellers and have sourced a good goldsmith who is able to sell you 100 ounces of gold for one million rand. You approach your two main customers. Mr Martyn says he will buy the gold from you in six months for R 1,040,000, whereas Ms Kuchner tells you that she will be able to buy the gold from you in two years' time for R1,160,000. What is the annual percentage rate that Mr Martyn and Ms Kuchner are offering you? Which option should you go for?

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Nachgereichte Ergebnisse:

0.008 bzw. 8 %

### Exercise 19 - Perpetuities (4-A10)

An investor purchasing a British consol is entitled to receive annual payments from the British government for ever. What is the price of a consol that pays € 4 annually if the next payment occurs one year from today? The market interest rate is 3 per cent.

### Exercise 20 - Net Present Value / NPV (4-A12)

FIFA rules regarding players contracts are very interesting. If a player wishes to break his contract, the purchasing club must pay the players's club four times the player's annual salary multiplied by the number of years left on the contract.

The player must pay 10 per cent of this amount personally, and the agent must also pay 10 per cent of the amount from his own pocket.

Consider the footballer Cristiano Ronaldo, who was widely rumored to be leaving Manchester United for Real Madrid during the summer of 2008 (he actually joined in the summer of 2009).

At the time Ronaldo was earning € 120,000 a week, and had four years of his contract with Manchester United left.

- Calculate how much Ronaldo would have personally had to pay Manchester United if he left with 4 years remaining, 3 years remaining, 2 years remaining and 1 year remaining!
- If the appropriate annualized discount rate is 8 per cent, what is the present value to Ronaldo of breaking his contract with 4, 3, 2, 1 and 0 years remaining?
- Assume you are Ronaldo's agent and can personally earn € 5 million today from getting Ronaldo to sign a pre-contract agreement to join Real Madrid in the future.
- Calculate the net present value to you if Ronaldo left with 4 years remaining, 3 years remaining, 2 years remaining and 1 year remaining.

### Exercise 21 - Future Value (4-A16)

What is the future value in four years of € 1,000 invested in an account stated annual interest rate of 10 per cent:

- a) Compounded annually?
  - b) Compounded semi-annually?
  - c) Compounded monthly?
  - d) Compounded continuously?
  - e) Why does the future value increase as the compounding period shortens?
- 

$$FP = PV (1 + r)^T$$

- a) annualy FV =  $1000 (1 + 0.1)^4 = 1,464.10 \text{ €}$
- b) semi-annually FV =  $1000 (1 + 0.1/2)^{(4*2)}$
- c) monthly FV =  $1000 (1 + 0.1 /12)^{(4 * 12)}$
- d) continuusly

$$FV = PV ^{(eT)}$$

### Exercise 22 - (4A18)

- a) What is the annualized interest rate, compounded daily, that is equivalent to 12 per cent interest compounded semi-annually?
  - b) What is the daily compounded rate that is equivalent to 12 per cent compounded continuously?
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- semi-annually - twice a year
- quarterly - 4 times a year
- monthly - 12 times a year
- weekly - 52 times a year
- daily - 365 times a yeear
- continuous

$$FV = C (1 + (r / m))$$

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a)

$$(1 + (r/365))^{365} = (1 + (0.12/2))^2 (1 + (r/365))^{365} = 1.1236 (1 + (r/365)) = (1.1236)^{1/365} 1 + r /365 = 1,000319 \text{ r= } 1.000319 \times 365 \text{ r} = 11.6556\% (11,6435 \% \text{ gerundet})$$

b)

$$(1 + (r/365))^{365} = e^{0.12} = 1.127497 (1 + (r/365)) = 1.12^{1/365} 1 + r/365 = 1.000329 \text{ r} = 0.00329 \times 365 \text{ r} = 12.002 \%$$

Antwortsatz: "Der Zinssatz, der täglich gezahlt wird und dabei den kontinuierlichen Zinssatz (12%) entspricht müsste bei 12,002 % liegen." - Tutor



### Exercise 23 - Growing Perpetuities (C4E19)

Marcus Boruc has been working on a new hands-free telephone that clips into your ear. The new gadget has now been cleared for manufacture and development. Marcus anticipates his first annual cash flow from the phone to be €200,000, received two years from today. Subsequent annual cash flows will grow at 5 per cent in perpetuity. What is the present value of the phone if the discount rate is 10 per cent?

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Perpetuity: A constant stream of cash flows that never ends

PV of a growing perpetuity:  $PV = C/(r-g)$

Where  $g$  is the *perpetual growth rate*

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$PV = (C / (r - g))$ , however Marc receives two years from today, therefore  $PV = (C / (r - g)) * (1 / (1 + r)) = (200.000 \text{ €} / (0,1 - 0,05)) * (1 / (1 + 0,1)) = 3,636,363.64 \text{ €}$

### Exercise 24 - Calculating Interest Expense (4A21)

You receive a credit card application from Shady Banks plc offering an introductory rate of 1.90 per cent per year, compounded monthly for the first six months, increasing thereafter to 16 per cent per year compounded monthly.

Assuming you transfer the €4,000 balance from your existing credit card and make no subsequent payments, how much interest will you owe at the end of the first year?

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Here we need to find the FV of lump sum, with a changing interest rate. We must solve this problem in two parts. After the first six months, the balance will be:

$$FV = € 4000 [1 + (.019/12)]^6 = 4038,15 \text{ €}$$

This is the balance in six months. The FV in another six months will be:

$$FV = 4038.15 [1 + (.16/12)]^6 = 4372,16 \text{ €}$$

The problem asks for interest accrued, so, to find the interest, we subtract the beginning balance from the FV. The interest accrued is:

$$\text{Interest} = 4372.16 \text{ €} - 4000.00 \text{ €} = 372.16 \text{ €}$$

### Exercise 25 - Ballon Payments (A422)

Mario Guiglini has just sold his hotel and purchased a restaurant with the proceeds. The cost of the restaurant to Mario is €500,000 and the seller requires a 25 per cent up-front payment. Mario is able to pay the up-front payment from the proceeds of the hotel sale. He needs to take out a mortgage and has been able to arrange one with Unicredit Bank that charges a 9 per cent APR. Mario will make equal monthly payments over the next 30 years. His first payment will be due one month from now. However, the mortgage has an eight-year-balloon payment option, meaning that the balance of the loan could be paid off at the end of year 8. There were no other transaction costs or finance charges. How much will Mario's balloon payment be in eight years?

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Annuity: A level stream of cash flows that last for a fixed number periods

PV of an annuity:  $PV = C [1/r - (1 / (r (1 + r)^T))]$  =  $C[(1-(1/(1+r)^T) / r)]$

The last term in the brackets is called the Annuity factor,  $A^T_p$

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(Anzahlung:  $500,000 \text{ €} * 25 \% = 125,000 \text{ €}$ )

The amount borrowed is the value of the restaurant times one minus the down payment, or:

Amount borrowed =  $500,000 \text{ €} (1 - .25) = 275.000 \text{ €}$

the monthly payments with ballon payment loan are calculated assuming a longer amortisation schedule, in this case, 30 years. The payments based on a 30-Year repayment schedule would be:

$PVA = 375,000 \text{ €} = C \{ [1 - (1 / (1 + 0.09/12)^{360})] / (0.09/12) \}$

$C = 2922.96 \text{ €}$

Now (at time = 8) we need to find the PV of the payments which have not been made. The ballon payment will be:

$PVA = 2922.96 \text{ €} * ((1 - (1 / (1 + 0.09/12)^{(22*12)}) / (0.09/12))$   $PVA = 344657,65 \text{ €}$

Alpha:  $335500 \text{ €}$

Nachgereichte Ergebnisse:

$C = 2.017,3348 \text{ €}$   $PVA = 346.352.59 \text{ €}$

## Exercise 26 - Annuities (4A26)

Today, you have become a new mother and the British government has given you €250 for your child's trust fund. You think it would be a great idea to use this as the basis for saving for your child's future. You believe in private schooling and so you want to put aside a certain amount each year to pay for your child's

- primary schooling (ages 5–11),
- secondary schooling (ages 12–17) and
- university tuition (ages 18–22).

Private primary schooling costs €7,000 per year and private secondary schooling costs €8,000 per year.

If your child gets into university, the fees and maintenance will be in the region of € 15,000 per year.

Your child will start school five years from now, and you plan to deposit money every year in the trust fund, starting one year from now. The annual percentage rate you've been quoted by the government is 6.5 per cent. How much money must you deposit in an account each year to fund your child's education? You will make your last deposit when your child enters university.

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250 € once annually deposit starting one year from now

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private schooling costs: primary school (5 - 11) 7000 €/year secondary school (12 - 17) 8000 €/year university tuition (18 - 22) 15000€/year

Step 1 Calculate the present value of primary schooling, secondary schooling and university tuition the year before the activity starts.

- a) Primary schooling (7 years)  $PV = C \times A_{7,0.065} = 7000 \text{ €} \times A_{7,0.065} = 38391.64 \text{ €}$
- b) Secondary schooling (6 years)  $PV = C \times A_{6,0.065} =$
- c) university tuition ()

Step 2 Calculate the present value of primary schooling, secondary schooling and university tuition.

- a) Primary Schooling  $PV = 38391.64 / (1.065)^4 = 29842.71 \text{ €}$
- b) Secondary schooling  $PV = 38728.11 / (1.065)^{11} = 19372.27 \text{ €}$
- c) University schooling  $PV = 51386.98 / (1.065)^{17} = 17616.10 \text{ €}$

Present value of all payments =  $29842.71 \text{ €} + 19372.27 + 17616.10 = 66831.08$

Since you already have 350 € from the government, the amount you need to invest is  $66831.08 - 250 \text{ €} = 66581.08$

$PV = C \left( \frac{1}{r} - \frac{1}{(r \times (1 + r)^T)} \right) = 66581.08 \text{ €} = C \left( \frac{1}{0.065} - \frac{1}{(0.065 \times (1.065^{18}))} \right)$   $C = 6382.10 \text{ €}$

## Exercise 27 - Definition of a bond (5A1)

What are the main characteristics of a bond? Provide examples of different types of bond in terms of coupons, maturity and face value.

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- The face value or principal
  - The term to maturity
  - The coupon rate and
  - The frequency of coupon payments.

A zero coupon bond has no coupon and only pays the face value at expiry.

A coupon bond can have a fixed coupon where coupon payments are fixed for the life of a bond or a floating coupon where payments are based on some benchmark such as LIBOR or EURIBOR.

## Exercise 28 - ?!

ist gestrichen => Generaltutorium? Übung?

## Exercise 29 - Valuing Bond (5A10)

In March 2009 the German freight company Deutsche Bahn issued a 10-year bond with face value of € 1,000 and paying an annual coupon of 4.875 per cent. What is the price of the bond if the yield to maturity (YTM) is

- a) 4 per cent?
- b) 5 per cent?
- c) 10 per cent?

Yield to maturity = Rückzahlungsrendite

If the yield to maturity for a bond is less than the bond's coupon rate, then the (clean) market value of the bond is greater than the par value (and vice versa). If a bond's coupon rate is less than its YTM, then the bond is selling at a discount. If a bond's coupon rate is more than its YTM, then the bond is selling at a premium. If a bond's coupon rate is equal to its YTM, then the bond is selling at par.

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$$PV = C \cdot A^T_r + F / (1 + r)^T$$

Where  $A^T_r$  is the annuity factor for an annuity of 1 € per period for T periods at an interest rate per period of r.

$$A^T_r = C \cdot [ (1 - (1 / (1 + r)^T) / r ) ]$$


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$$PV = C \cdot A^T_r + (F)/(1+r)^T$$

where  $A^T_r$  is the annuity factor for an annuity of 1 € per period for T periods at an interest rate per period of r.

$$A^T_r = C [ (1 - (1)/(1+r)^T) / (r) ]$$

$$P = 48,75 \cdot [ (1 - (1)/(1 + 0,04)^{10}) / (0,04) ] + (1000)/(1,04)^{10} = 1070,97$$

a)

$$P = € 48,75 \cdot A^{10}_{0.04} + 1000 / 1.04^{10} \quad P = € 1070,97$$

b)

$$P = € 48.75 \cdot A^{10}_{0.05} + 1000 / (1.05)^{10} \quad P = € 990,35$$

c)

$$P = P = € 685,09$$

## Exercise 30 - Share Values (5A12)

In 2009 DaimlerChrysler had just paid a dividend of €2 per share on its equity. The dividends are expected to grow at a constant rate of 5 per cent per year indefinitely. If investors require a 11 per cent return on DaimlerChrysler's equity, what is the current price? What will the price be in three years? In 15 years?

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Zero growth:  $P_0 = D_1 / r$

Constant growth:  $P_0 = D_1 / (r - g)$

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Zero growth:  $P_0 = (D_1)/(r)$  Constant growth:  $P_0 = (D_1)/(r - g)$

Current price at a constant growth of 5 percent per year indefinitely:

$P = \text{Div}_1 / (r - g)$ , whereas  $\text{Div}_1 = D_0 (1 + g)$  i.e.  $\text{Div}_1 = 2 (1.05) = € 2.1$

$P = € 2.1 / (0.11 - 0.05) = 35 €$

$P_0 \rightarrow \text{Div}_1$

Price in 3 years:  $P_3 = P_0(1 + g)^3 = 35 € * (1.05)^3 = € 40.52$

Price in 15 years:  $P_{15} = P_0 (1 + g)^{15} = € 35 * (1.05)^{15} = 72.76 €$

### Exercise 31 - Share Values (5A13)

The next dividend payment from French health food firm Danone will be € 1.12 per share. The dividends are anticipated to maintain a 5 per cent growth rate for ever. If Danone shares currently sell for €35.00, what is the required return?

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Zero growth:  $P_0 = D_1 / r$

Constant growth:  $P_0 = D_1 / (r - g)$

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Zero growth:  $P_0 = (D_1)/(r)$  Constant growth:  $P_0 = (D_1)/(r - g)$

Äquivalenzumformung:

$P_0 = (D_1)/(r - g) \mid * (r - g) \mid P_0 * (r - g) = (D_1) \mid / P_0 \mid r - g = (D_1)/ P_0 \mid + g \mid r = (D_1)/ P_0 + g$

$\text{Div}_1 = D_1, R = r$

$\Rightarrow R = 1.12 / 35 + 0.05 = 8.2 \%$

### Exercise 33 - Bond Return (5A18)

A six-year government bond makes annual coupon payments of 5 per cent and offers a yield of 3 per cent annually compounded. Suppose that one year later the bond still yields 3 per cent.

What return has the bondholder earned over the 12-month period?

Now suppose that the bond yields 2 per cent at the end of the year. What return would the bondholder earn in this case?

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$PV = C * A^T_r + F / (1 + r)^T$

Where  $A^T_r$  is the annuity factor for an annuity of 1 € per period for T periods at an interest rate per period of r.

$A^T_r = C * [ (1 - (1 / (1 + r)^T) / r ) ]$

The return on the bond is  $[(P_1 + C) / P_0] - 1$

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$$PV = C * A^T_r + (F)/(1+r)^T$$

where  $A^T_r$  is the annuity factor for an annuity of 1 € per period for T periods at an interest rate per period of r.

$$A^T_r = C [(1 - (1)/(1+r)^T)/(r)]$$

a)

$$P = 50 * [(1 - (1)/(1 + 0,03)^6)/(0,03)] + 1000 / 1,03^6 = 1.108,34 \quad P_1 = 50 * [(1 - (1)/(1 + 0,03)^5)/(0,03)] + 1000 / 1,03^5 = 1.091,59 \dots \quad P_2 = 44$$

If yields fall to 2 %:

$$P = 50 * A^5_{0.03} + 1000 / 1+R^5 ???$$

The return on the bond is  $[(P_1 + C)/(P_0)] - 1$

After one year, the return is:  $[(1,091.59 + 50) / 1,108.34] - 1 = 3 \%$

In the second example, the return is:  $[(1,141.40 + 50) / 1,108.34] - 1 = 7.49 \%$

b)

analog

### Exercise 34 - Non-Constant Growth (5A19)

Dylan Bearings is a young start-up company. No dividends will be paid on the shares over the next nine years because the firm needs to plough back its earnings to fuel growth. The company will pay an € 8 per share dividend in 10 years and will increase the dividend by 6 per cent per year thereafter. If the required return is 13 per cent, what is the current share price?

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Here we have an equity that pays no dividends for 10 years. Once it begins paying dividends it will have a constant growth rate of dividends.

We can use the constant growth model at that point. It is important to remember that the general form of the constant dividend growth formula is:

$$P_t = [D_t * (1 + g)] / (R - g)$$

This means that since we will use the dividend in Year 10, we will be finding the share price in Year 9. The dividend growth model is similar to the PVA and the PV of a perpetuity:

The equation gives you the PV one period before the first payment. So, the price of the equity in year 9 will be:

$$P_9 = D_{10} / (R - g) = € 8.00 / (0.13 - 0.06) = € 114.29$$

The price of the share today is simply the PV of the share price in the future. We simply discount the future share price at the required return.

$$P_0 = € 114.29 / 1.13^9 = € 38.04$$

### Exercise 35 - Calculating Payback Period and NPV (6A9)

Hideoshi Software has the following mutually exclusive projects.

- a) Suppose Hideoshi's payback period cut-off is two years. Which of these two projects should be chosen?

Year	Project A (¥)	Project B (¥)
0	- 5.500	- 4.000
1	4.000	2.500
2	5.500	1.200
3	500	3.000

Abbildung 4: mutually exclusive projects

- b) Suppose Hideoshi uses the NPV rule to rank these two projects. Which project should be chosen if the appropriate discount rate is 10 per cent?

- a) The payback period is the time that it takes for the cumulative undiscounted cash inflows to equal the initial investment.

#### Project A

Cumulative cash flows year 1: €4000 = €4000 Cumulative cash flows year 2: €4000 + 5500€ = 9500 € > 5500€  
The payback period is less than the 2 year cut-off and so project A would be accepted.

#### Project B

Cumulative cash flows year 1: €2500 = €2500 Cumulative cash flows year 2: €2500 + 1200€ = 3700 € Cumulative cash flows year 3: €2500 + 1200€ + 3000€ = 6700 € > 4000€ The payback period is greater than the 2 year cut-off and so project B would not be accepted.

- b) Discount each project's cash flows at 10 percent. Choose the project with the highest NPV.

Project A:  $NPV = -€5500 + €4000/1.10 + 5500€/1.10^2 + 500€/1.10^3$   $NPV = 3057.48 €$

Project B:  $NPV = -4000€ + 2500€/1.10 + 1200/1.10^2 + 3000/1.10^3$   $NPV = 1518,407 €$

The firm should choose Project A since it has a higher NPV than Project B has.

Klausurtripp: Bei weiterer Ein-/Auszahlung Werte für Nenner ausrechnen!

### Interpolation zur Bestimmung des Amortisierungszeitraum

Companies can calculate a more precise value using fractional years. To calculate the fractional payback period, find the fraction of year 2's cash flows that is needed for the company to have cumulative undiscounted cash flows of €5,000. Divide the difference between the initial investment and the cumulative undiscounted cash flows as of year 2 by the undiscounted cash flow of year 2.

Payback period =  $1 + (€5,500 - €4,000) / €5,500$  Payback period = 1.27

### Exercise 36 - Calculating discounted Payback (6A11)

An Investment project has annual cash inflows of € 7.000, € 7.500, € 8.000 and € 8.500 and a discount rate of 10 per cent. What is the discounted payback period for these cash flows if the initial cost is € 8.000? What if the initial cost is € 13.000? What if it is € 18.000?

Idee:  $(8000 + 7000) / 1.10 + \text{etc.}$

When we use the discounted payback, we need to find the value of all cash flows today.

The value today of the project cash flows for the first 4 years is:

Value today of year 1 cash flow =  $7000/1.10^1 = 6363,64 \text{ €}$  Value today of year 1 cash flow =  $7500/1.10^2 = 6198,35 \text{ €}$  Value today of year 1 cash flow =  $8000/1.10^3 = 6010,52 \text{ €}$  Value today of year 1 cash flow =  $8500/1.10^4 = 5805,61 \text{ €}$

Payback period =  $1 + (8000 - 6363,64)/6198,35 \text{ €} = 1,?$

To find the discounted payback, we use these values to find the payback period.

The discounted first year cash flow is 6363,64 €, so the discounted payback for an 8000 € initial cost is: Discounted payback =  $1 + (\text{€}8000 - 6363,64)/6198,35 = 1.26 \text{ years}$

for an initial cost of 13000€ initial cost of 13000 the discounted payback is:

Discounted payback =  $2 + (18000 - 6363.64 - 6198,35) / 6010,52 \text{ €} = 2.90 \text{ years}$

We know the initial /\* Text fehlt \*/

Tipp: Erste Aufgabe noch mal dynamisch machen. Dabei müsste ungefähr das selbe rauskommen.

### Exercise 37 - Average Accounting Return (AAR) (6A13)

Bluerock Group has invested € 8000 in a high-tech project lasting 3 years.

Deprecation (= Abschreibung) is € 4000, € 2500 and € 1500 in year 1,2 and 3 respectively. The project generate pre-tax income of € 2000 each year.

The pre-tax income already includes the depreciation expense. If the tax rate is 25 % what is the projects average accounting return (AAR)?

---

**First**, we need to determine the average book value of the project. The book value is the gross investment minus accumulated depreciation.

	Purchase date	Year I	Year II	Year III
Gross Investment	8000 \text{\euro}		8000 \text{\euro}	8000 \text{\euro}
Less accumulated depreciation	0 \text{\euro}		4000 \text{\euro}	6500 \text{\euro}
= net investment	8000 \text{\euro}		4000 \text{\euro}	1500 \text{\euro}

**Second**, Now we can calculate the average book value as:

Average book value =  $(8000 \text{ €} + 4000 \text{ €} + 1500 \text{ €} + 0 \text{ €}) / 4 \text{ (years)} = 3,375 \text{ €}$

Tipp: Selber noch mal googlen, wenig informationen zu dieser angelsächsischen Variante vorhanden,

To calculate the average accounting return, we must remember to use the aftertax average net income when calculating the average accounting return. So the average aftertax income is:

Average aftertax net income =  $(1 - t_c) \text{ Annual pretax net income}$  Average aftertax net income =  $(1 - 0.25) \text{ €} 2000$   
Average aftertax net income = 1500 €

The average accounting return is the average after-tax net income divided by the average book value, which is:

Average accounting return =  $1500 \text{ €} / 3,375 \text{ €}$  Average accounting return = 0.4444 or 44.44 %



### Exercise 38 - Calculating IRR (6A14)

Calculate the NPV of the following project for discount rates of 0, 50 and 100 per cent. What is the IRR of the project?

Year	0	1	2
Cash Flow	$\text{\text{\euro}} -7000$	$\text{\text{\euro}} 5000$	$\text{\text{\euro}} 20000$

---

/\* Einzelarbeit \*/

$$\text{NPV} = -7000 + 5000/(1 + 0) + 20000/(1 + 0)^2 = 18000 \text{ €}$$

$$\text{NPV} = -7000 + 5000/(1 + 0.5) + 20000/(1 + 0.5)^2 = 5222,22 \text{ €}$$

$$\text{NPV} = -7000 + 5000/(1 + 1) + 20000/(1 + 1)^2 = 500 \text{ €}$$

The IRR is equal to:

$$\text{NPV} = 0 = -7000 + 5000 \text{ €}/(1 + \text{IRR})^1 + 20000/(1 + \text{IRR})^2$$

Thorough trial and error or solver in an excel spreadsheet, IRR is equal to 108.48 %.

### Exercise 39 - Problems with the IRR (6A6)

Review the main problems that arise when one uses only IRR to evaluate potential projects.

---

There are several issues the analyst must consider when using IRR to value investments:

- First they must consider whether a collection of candidate projects are mutually exclusive and/or independent.
- Secondly, it is not possible to compare projects if the scale of their investments are different. Therefore a small scale project may have a high IRR but increase the wealth by very little in absolute terms.
- Thirdly, one must be careful when using IRR for projects that require investment or borrowing.
- Fourthly, if the cash flows from the project change more than once then it is very likely that the project will have more than one IRR value.

### Exercise 40 - Calculating Profitability Index (6A17)

Suppose the following two independent investment opportunities are available to Greenplain Ltd. The appropriate discount rate is 10 per cent.

Year	Project Alpha ( $\text{\text{\euro}}$ )	Project Beta ( $\text{\text{\euro}}$ )
0	-500	-2.000
1	300	300
2	700	1.800
3	600	1.700

- Compute the profitability index for each of the two projects.
  - Which project(s) should Greenplain accept, based on the profitability index rule?
-

- a) The profitability index is the present value of the future cash flows divided by the initial cost. So for Project Alpha the profitability index is:

$$PI_{\alpha} = [300\text{€}/1.10 + 700\text{€}/1.10^2 + 600\text{€}/1.10^3]/500\text{€} = 2.604$$

And for Project Beta the Profitability index is:

$$PI_{\beta} = [300\text{€}/1.10 + 1800\text{€}/1.10^2 + 1700\text{€}/1.10^3]/2000\text{€} = 1.519$$

- b) According to the PI, you would accept Project Alpha. However, remember the profitability index rule can lead to an incorrect decision when ranking mutually exclusive projects.

### Exercise 41 - Comparing Investment Criteria (6A24)

The treasurer of Amaro Canned Fruits has projected the cash flows of projects A, B and C as follows:

Year	Project A (\text{\euro})	Project B (\text{\euro})	Project C (\text{\euro})
0	-100.000	-200.000	-100.000
1	70.000	130.000	75.000
2	70.000	60.000	130.000

Suppose the relevant discount 12 per cent per rate is year.

- Compute the profitability index for each of the three projects.
- Compute the NPV for each of the three projects.
- Suppose these three projects are independent. Which project(s) should Amaro accept, based on the profitability index rule?
- Suppose these projects are mutually exclusive. Which project(s) should Amaro accept, based on the profitability index rule?
- Suppose Amaro's budget for these projects is €300.000. The projects are not dividable. Which project(s) should Amaro accept?

a)  
Pro-  
fita-  
bility  
in-  
de-  
xes

$$\begin{aligned} &PI\_ProjectA \\ &= \\ &[70.000/1.12 \\ &+ \\ &70.000/1.12^2 \\ &] / \\ &100.000 \end{aligned}$$

$$\begin{aligned} &\text{€} = \\ &1.18 \end{aligned}$$

$$\begin{aligned} &PI\_ProjectB \\ &= \\ &[130.000/1.12 \\ &+ \\ &130.000/1.12^2] \\ &/ \text{€} \end{aligned}$$

$$\begin{aligned} &= \\ &1.10 \end{aligned}$$

$$\begin{aligned} &PI\_ProjectC \\ &= \\ &[75.000/1.12 \\ &+ \\ &60.000/1.12^2] \\ &/ \text{€} \end{aligned}$$

$$\begin{aligned} &= \\ &1.15 \end{aligned}$$

b)  
Net  
Pre-  
sent  
Va-  
lue

$$\begin{aligned} &NPV\_a \\ &= - \\ &100.000 \\ &+ \\ &70.000/1.12 \\ &+ \\ &70.000 \\ &/ \\ &1.12 \\ &+ \\ &70.000 \\ &/ \\ &1.12^2 \\ &= \\ &18803.57 \end{aligned}$$

$$\begin{aligned} &NPV\_b \\ &= \end{aligned}$$

$$\begin{aligned} &190 \\ &197.21 \\ &NPV\_c \\ &= \\ &14095,92 \end{aligned}$$

c)  
Ac-

In the context of capital budgeting, what is an opportunity cost?

---

In this context an opportunity cost refers to the value of an asset or other input that will be used in a project, the relevant cost is what the asset instead is actually worth today. Not for example its cost to acquire.

### Exercise 43 - Inflation and Capital Budgeting (7A3)

In an hyperinflationary environment, how would you incorporate inflation into a capital budgeting analysis? Explain your methodology in words to a manager who is worried about the power of capital budgeting when inflation is very high.

---

Capital budgeting can easily incorporate price increases through inflation into its analysis. The key concept is consistency. If prices are rising at a high rate, you could use nominal cash flows which include the price increases from inflation and a nominal discount rate. A nominal discount rate also includes the effect of inflation.

### Exercise 45 - Inflation and company value (7A17)

Sparkling Water Plc expects to sell 2 Million bottles of drinking water each year in perpetuity. This year each bottle will sell for £1.25 in real terms and will cost £0.70 in real terms. Sales income and costs occur at year-end. Revenues will rise at a real rate of 7 per cent annually, while real costs will rise at a real rate of 5 per cent annually. The real discount rate is 10 per cent. The corporate tax rate is 28 per cent. What is Sparkling worth today?

---

To determine the value of a firm, we can simply find the present value of the firm's future cash flows. No depreciation is given, so we can assume depreciation is zero. Using the tax shield approach, we can find the present value of the aftertax revenues, and the present value of the aftertax costs. The required return, growth rates, price, and costs are all given in real terms. Subtracting the costs from the revenues will give us the value of the firm's cash flows. We must calculate the present value of each separately since each is growing at a different rate. First, we will find the present value of the revenues. The revenues in year 1 will be the number of bottles sold, times the price per bottle, or:

Aftertax revenue in year 1 in real terms =  $(2.000.000 \times 1.25 \text{ €}) \times (1 - 0.28)$  Aftertax revenue in year 1 in real terms = 1.800.000 €

### Exercise 44 - Equivalent Annual Cost (7A19)

Bridgton Golf Academy is evaluating different golf equipment. The "Dimple-Max" equipment costs £45,000, has a three-year life and costs £5,000 per year to operate. The relevant discount rate is 12 per cent. Assume that the reducing balance (20 per cent) depreciation method is used. Furthermore, assume the equipment has a salvage value of £20,000 at the end of the project's life. The relevant tax rate is 28 per cent. All cash flows occur at the end of the year. What is the equivalent annual cost (EAC) of this equipment?

---

To calculate the EAC of an investment, first calculate the depreciation schedule.

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## Production/Investition Finanzierung - Zusammenfassung

Year		1	2	3
a) Starting Value		£45,000	£36,000	£28,800
b) Depreciation		£9,000	£16,200	£25,000
c) Accumulated Depreciation	20% (a)	£9,000	£7,200	£8,800
d) Residual Value	a) - c)	£36,000	£28,800	£20,000

Now use the depreciation schedule to estimate the operating cash flow.

	1	2	3
Pre-Tax Operating Costs	-£ 5,000	-£ 5,000	-£ 5,000
Depreciation	-£ 9,000	-£ 7,200	-£ 8,800
= EBT	-£ 14,000	-£ 12,200	-£ 13,800
Tax (28%)	-£ 3,920	-£ 3,416	-£ 3,864
Net Income	-£ 10,080	-£ 8,784	-£ 9,936

	1	2	3
Net Income	-£ 10,080	-£ 8,784	-£ 9,936
Depreciation	£9,000	£7,200	£8,800
Operating Cash Flow	-£ 1,080	-£ 1,584	-£ 1,136

The cash flows for each year are now calculated.

	0	1	2	3
Investment	-£ 45,000			£ 20,000
Operating Cash Flow		-£1,080	-£ 1,584	-£ 1,136
Cash Flows	-£ 45,000	-£1,080	-£ 1,584	£ 18,864
PV Cash Flow	-£45,000	-£ 964	-£ 1,236	£ 13,427

The Net Present Value is -£33,800 and the Equivalent Annual Cost is -£33,800 = EAC(PVIFA12%,3) EAC = £14,072

### 7a17 - Nicht zuordnbar

Revenues will grow at seven percent per year in real terms forever. applying the growing perpetuity formula, we find the present value of the revenues is:

$$PV \text{ of revenues } = C_1 / (R - g) = 1800000 / (0.1 - 0.07) = 60.000.000 \text{ €}$$

The real aftertax costs in year 1 will be: Aftertax in year 1 in real terms =  $2000 * 0,7 \text{ €} / (1 - 0.28) = 1.008.000 \text{ €}$

- Zahlungen gleich für immer (Ewige Rente)
- Zahlungen gleich für bestimmte Zeit (Jede Zahlung einzeln abzinsen, Abzinsungsformel, Barwertfaktor)
- Zahlungen jedes mal anders (jeden faktor einzeln abzinsen)

Costs will grow at five percent per year in real terms forever. applying the growing perpetuity formula, we find the present value of the costs is

$$PV_{\text{costs}} = C_1 / (R - G) = 1008000 \text{ €} / (0.10 - 0.05) = 20160000$$

Now we can find the value of the firm, which is:

$$Value_{\text{firm}} = PV \text{ of revenues} - PV \text{ of costs} = 60000000 \text{ €} - 20160000 \text{ €} = 39840000 \text{ €}$$