Unit 6. Investment-financing relationship

6.1. Business Risk and Financial Risk
6.2. Weighted Average Cost of Capital
6.3. Adjusted Present Value (APV)
6.4. The Effects of Leverage on Expected Cash Flows and Discount Rates

Basic bibliography:
ROSS, S; WESTERFIELD, R; JAFFE, J. (2010)
Chapters 3.2 (formulas 3.15 and 3.16), 16.3-5, 17.1, 17.4, 18.1, 18.3-4

6.3 Adjusted Present Value (APV)

Remember: So far in Unit 6 we have seen that ↑ B/S =>↑Financial risk => ↑Rs
However ↑ B/S => does not reduce Rwacc and, therefore, does not increase the firm's value = NPV = -Initial investment + $\sum_{k=1}^{n} \frac{NCF_K}{(1+Rwacc)^k}$

Let's introduce now the effects that corporate tax has on the firm's value.

Example. Suppose you are analysing two possible scenarios in your company: A (no debt) and B (debt = 100 and Rb = 10%) under a corporate tax of t = 30%.

Income statement	*A (no debt)*	*B (debt = 100)*	
EBIT	*100*	*100*	
-Interest	*0*	*10*	*Rb B = 0.1*100*
EBI after interest	*100*	*90*	
Corporate tax (30%)	***30***	***27***	*Total assets =*
Net profit	*70*	***63***	*= Total liab. and equity=300*
ROE	***70/300 = 0.233***	***63/200 = 0.315***	

A pays more corporate tax than B, exactly 3 more units = 30% 10 = 3 = t Rb B

B is getting a reduction in tax due to interest payments. This reduction is called tax shield or tax subsidy.

Tax subsidy = t Rb B

Western governments are giving a "present" in terms of reduction in corporate tax to the companies financed with debt: ↑ B/S → ↓corporate tax

=> Why?

After much thought, I can't find a fully convincing answer.

Actually, ↑ B/S =>↑financial risk; therefore, western governments are pushing the companies to increase leverage and thus pushing the economic system towards higher instability, as shown in the 2008 financial and economic crisis.

Each time the company pays 10 to the lender (bank), the government says: "do not worry, firm, the whole country will pay you 3 out of those 10 (subsidy), so finally you pay only 7".

Unit 6 conclusions:

- ↑ B/S → ↑Financial risk => ↑Rs
- Assuming <u>no corporate tax</u>:
  ↑ B/S => does not reduce Rwacc and, therefore, does not increase the firm's value = NPV = -Initial investment + $\sum_{k=1}^{n} \frac{NCF_K}{(1+Rwacc)^k}$
  Then,
  companies trying to increase value focus on investing in NPV>0 projects (NPV is calculated considering the firm is an all-equity firm)
- <u>With the western countries' corporate tax design</u>:
  ↑ B/S → ↓corporate tax → ↓ cash outflows → ↑ net present values adjusted to financial side effects such as the tax subsidy (adjusted present value (APV)

Let's see some examples in Unit 6: Problems 3 and 4 and Assignment 3.

<u>Food for thought:</u>

How could a government reduce the incentives to firm leverage?

a) By reducing the tax rate, *t*, from 30% to a lower rate, such as 18%? YES

b) By limiting the maximum deduction on interest? YES

c) By applying an exemption from corporate tax on a certain percentage of the net profit? YES

d) By eliminating the interest deduction? YES

e) By reducing the administrative and bureaucratic costs of costs ↑ equity? YES

In our online class we will raise questions about several possibilities. Let's start thinking ☺

Problem 3. NPV and APV. We will learn about:

a) How to increase value through depreciation
b) APV calculations and differences between NPV and APV

"Zoso is a rental car company that is trying to determine whether to add 25 cars to its fleet. The company fully depreciates all its rental cars over five years using the straight-line method. The new cars are expected to generate $140,000 per year in earnings before taxes and depreciation for five years. The company is entirely financed by equity and has a 35% tax rate. The required return on the company's unlevered equity is 13 percent, and the new fleet will not change the risk of the company.

a) What is the maximum price that the company should be willing to pay for the new fleet of cars if it remains an all-equity company?

b) Suppose the company can purchase the fleet of cars for $395,000. Additionally, assume the company can issue $260,000 of five-year, 8 percent debt to finance the project. All principal will be repaid in one balloon payment at the end of the fifth year. What is the adjusted present value (APV) of the project?" ROSS, S; WESTERFIELD, R; JAFFE, J. (2010), p. 569

a) The maximum price that the company should be willing to pay for the fleet of cars with all-equity funding is the price that makes the NPV of the transaction **equal to zero**.

Let's write the NPV formula for this case. Assume the price that the company should be willing to pay is P:

Income Statement	***Years 1 to 5***
EBITDA	*140,000*
-Depreciation	*P/5*
EBIT	*140,000-P/5*
-Corporate Tax (35%)	*49,000-0.35P/5*
Net Profit	***91,000-P/5+0.35P/5***
Net Cash Flow	***Years 1 to 5***
Net Profit	*91,000-P/5+0.35P/5*
+ Depreciation	*P/5*
Net Cash Flows	***91,000+0.35P/5***

Solving this formula gives us:

NPV= 0 = -P + 91,000 a $_{5,\ 13\%}$ + 0.35 P/5 a $_{5,\ 13\%}$

Why is the opportunity cost of capital r = 13%? 13% is the required return on the company's unlevered equity = Rs of the all-equity firm = Ro (see the graph in 6.2)

We have to use Rwacc. As this is an all-equity firm we have to use Rwacc of an all-equity firm = Ro

P = $424,609.54 is the maximum price that the company should be willing to pay. If the company pays more than this for the new fleet of cars, the NPV of this investment will be negative, NPV<0, so the investment will not add value to the company.

The maximum price that the company should pay is P= $424,609.54 in order to add value with this investment project.

Important: As you can see in the NPV, depreciation plays an important role in the value of this project, + 0.35 P/5. Depreciation= P/5

Depreciation tax shield = tD = 0.35 D

The higher the depreciation, the higher the depreciation tax shield and, consequently, the higher the NPV.

To better understand the role played by depreciation let's get new net cash flows by changing the straight-line depreciation to an accelerated depreciation method:

Income Statement	***Year 1***	***Year 2***	***Year 3***	***Year 4***	***Year 5***
EBITDA	*140,000*	*140,000*	*140,000*	*140,000*	*140,000*
-Depreciation	141,536.513	113,229.211	84,921.908	56,614.6053	28, 307.3027
EBIT	*-1,536.513*				
-Corporate Tax (35%)	*+ 537.78*				
Net Profit	***-998.73***				
Net Cash Flow	***Year 1***	***Year 2***	***Year 3***	***Year 4***	***Year 5***
Net Profit	***-998.73***				
+Depreciation	141,536.513				
Net Cash Flow	***140,537.78***				

Accelerated depreciation over 5 years: Acquisition value = Va = $424,609.54

5X + 4X + 3X + 2X + X = 424,609.54 15X = 424,609.54 X = 28,307.3027

Year 1 depreciation = 5X = $141,536.513
Year 2 depreciation = 4X = $113,229.211
Year 3 depreciation = 3X = $84,921.908
Year 4 depreciation = 2X =$56,614.6053
Year 5 depreciation = 1X =$28, 307.3027

TOTAL = 424,609.54

Your work: Please, fill in the blanks in the Table (years 2 to 5) and calculate the NPV.

Is it higher than the one calculated in page 1 (straight-line depreciation)?

Why? **By depreciating more at the beginning, the depreciation tax shield tD is higher at the beginning => Net cash flows are higher at the beginning. One euro today is worth more than one euro later.**

Does depreciation mean payment? NO. Depreciation is a non-cash expense; the only effect of depreciation on net cash flows is to reduce our taxes, a benefit to us.

Does depreciation mean higher financial risk? NO
Does depreciation mean hard negotiations with creditors, binding contracts or hard negotiations with suppliers, clients or stockholders? NO. It is simply good knowhow of the financial manager that increases value, gets more cash flows sooner and, therefore, places the company in a stronger position, creating more value.

Does depreciation mean cash in the company? YES, at the end of the year, when we write depreciation 5€, we put 5€ aside, to add up to the money we get from net profit.

Video 6.3d ….Mr. Potato example ☺

See examples of NPV with accelerated depreciation and straight-line depreciation in Aula Virtual (from the software Research^{+} Cash ®).

- Would you recommend depreciating over 3 years instead of 5 years if there is margin within the law? Yes, the speedup of depreciation will greatly benefit the company.

Please, create a simple example with simple numbers and answer these questions. THIS IS GOING TO BE AN EXERCISE IN THE FINAL EXAM.

T = 30%; Va = 100; Vr = 0; opportunity cost of capital = 10%

a) n = 5; straight-line deprec., annual depr.= $\frac{100-0}{5}$=20; tax subsidy = tD = 0.3*20 = 6

Present value of tax subsidy= $\frac{6}{(1+0.1)}+\frac{6}{(1+0.1)^2}+\frac{6}{(1+0.1)^3}+\frac{6}{(1+0.1)^4}+\frac{6}{(1+0.1)^5}$=22.75€

	6	6	6	6	6
0	1	2	3	4	5

b) n = 3; str.-line depr., annual depr. = $\frac{100-0}{3}$= 33.33; tax subsidy = tD = 0.3*33.33 = 10

Present value of tax subsidy = $\frac{10}{(1+0.1)}\frac{10}{(1+0.1)^2}\frac{10}{(1+0.1)^3}$= 24.87€

	10	10	10
0	1	2	3

- Would you recommend a residual value = 0 or higher?

T = 30%; Va = 100; n=5; opportunity cost of capital = 10%

c) Vr = 20; str.-line depr., annual depr. = $\frac{100-20}{5}$= 16; tax subsidy = tD = 0.3*16 = 4.8

Tax subsidy Vr = tD = 0.3*20 = 6

Present value of tax subsidy = $\frac{4.8}{(1+0.1)} + \frac{4.8}{(1+0.1)^2} + \frac{4.8}{(1+0.1)^3} + \frac{4.8}{(1+0.1)^4} + \frac{4.8+6}{(1+0.1)^5}$=21.93€

	4.8	4.8	4.8	4.8	4.8+6
0	1	2	3	4	5

d) Vr = 0; str.-line depr., annual depr. = $\frac{100-0}{5}$=20; tax subsidy = tD = 0.3*20 = 6

Present value of tax subsidy = 22.75€ see a)

Under current accounting rules, firms are given some amount of leeway. Accounting margin exists for depreciation: accelerated vs. straight-line depreciation, speed of depreciation, and residual values.

By depreciating sooner, the company pays the same amount of total tax (over the 5 years) but later. One euro today is worth more than one euro later.

In order to:

↓corporate tax and therefore ↓ cash **out**flows, which ↑ NFC and thus ↑ net present value: Depreciation versus interest payments

1) ↑ B/S => ↑Interest payments => ↑Financial risk => ↑required Rs because ↑strict payment duties at a due date which in turn ↑ bankruptcy probability

2) Using accelerated and shorter depreciation instead of straight-line and longer depreciation has none of the drawbacks that interest payments have.

Problem 3. **NPV and APV.**

"Zoso is a rental car company….

b) Suppose the company can purchase the fleet of cars for $395,000. Additionally, assume the company can issue $260,000 of five-year, 8 percent debt to finance the project. All principal will be repaid in one balloon payment at the end of the fifth year. What is the adjusted present value (APV) of the project?"

Income Statement	***Years 1 to 5***
EBITDA	*140,000*
-Depreciation	*79,000*
EBIT	*61,000*
-Corporate Tax (35%)	*21,350*
Net Profit	***39,650***
Net Cash Flow	***Years 1 to 5***
Net Profit	*39,650*
+ Depreciation	*79,000*
Net Cash Flows	***118,650***

Annual depreciation = $395,000/5 = $79,000

Adjusted present value (APV) = NPV $_{\text{all-equity firm}}$ + PV $_{\text{financing side effects}}$

See 6.3 APV at RWJ (Aula Virtual)

NPV $_{\text{all-equity firm}}$ = -$395,000 + 118,650 a $_{5,\ 13\%}$ = $22,319.49

PV $_{\text{financing side effects}}$ =

- **Cash flows from this loan:**

+260,000_____-13,520____-13,520_____-13,520_____-13,520_____-13,520-260,000
0 1 2 3 4 5

Interest payments = $260,000*0.08 = $20,800
-Tax shield = $20,800*0.35 = $7,280
$13,520

PV $_{\text{financing side effects}}$ = $260,000 - $13,520 a $_{5,\ 8\%}$ - $260,000/(1+0.08)^5 = $29,066.93

- **Let's see now the present value of the tax shield alone:**

_____7,280____7,280_____7,280_____7,280_____7,280
0 1 2 3 4 5

PV $_{\text{tax shield}}$ = $7,280 a $_{5,\ 8\%}$ = $29,066. 93

Adjusted present value (APV) = NPV $_{\text{all-equity firm}}$ + PV $_{\text{financing side effects}}$ =
$22,319.49+$29,066. 93 = $51,386.42

Assignment 3: Problem 4 (below) Upload solution in an Excel file to Aula Virtual. Connect assumptions to the table. Due date: April 22

Problem 4. Adjusted Present Value (APV)

"Gemini, Inc., an all-equity firm, is considering a $1.9 million investment that will be depreciated according to the straight-line method over its four-year life. The project is expected to generate earnings before taxes and depreciation of $685,000 per year for four years. The investment will not change the risk level of the firm. The company can obtain a four-year 9.5 percent loan to finance the project from a local bank. All principal will be repaid in one balloon payment at the end of the fourth year. The bank will charge the firm $28,000 in flotation fees, which will be amortized over the four-year life of the loan. If the company financed the project entirely with equity, the firm's cost of capital would be 13 percent. The corporate tax rate is 30 percent. Using the adjusted present value method, determine whether the company should undertake the project." ROSS, S; WESTERFIELD, R; JAFFE, J. (2010), p. 569