INTERNATIONAL FINANCE
FINANCIAL MODEL
Lesson 5

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Summary

- Lesson 4 exercise and solution
- Ke – Cost of equity
- WACC – Weighted average cost of capital
- IRR vs Yield
- Example

Exercise

P&L	0	1	2	3
Revenues		200	300	250
Costs		50	150	90
Ebitda		150	150	160
D&A		100	100	100
Ebit		50	50	60
Financial interests		9	6	3
Ebt		41	44	57
Tax		12	13	17
Net profit		**29**	**31**	**40**

Cash Flow	0	1	2	3
Net profit		29	31	40
D&A		100	100	100
Financial interests		9	6	3
Capex variation (-)	300			
Cash flow before debt	**(300)**	**138**	**137**	**143**
Debt drawdown	180			
Principal repayment		60	60	60
Financial interests		9	6	3
Cash flow after debt	**(120)**	**69**	**71**	**80**

Starting from the previous exercise, with initial capex 300, debt drawdown 180, calculate:

- DSCR (annual and average)
- LLCR (annual and average)
- D/E (annual and average)

For the D/E calculation, consider that:

- *the initial net cash out (120) would be an equity contribution*
- *the company will distribute all the cash flow after debt (as net profit + equity reduction)*

DSCR

DSCR
Debt Service
Cover Ratio

- DSCR = Cash Flow before debt / Debt Service
- Covenant: ADSCR (Average) ≥ Target

  DSCR min ≥ Target (over the project life)

Cash Flow	0	1	2	3
Cash flow before debt	**(300)**	**138**	**137**	**143**
Debt drawdown	180			
Principal repayment		60	60	60
Financial interests		9	6	3
Debt Service		**69**	**66**	**63**
Cash flow after debt	**(120)**	**69**	**71**	**80**
DSCR		**2,00**	**2,07**	**2,27**

Cash flow before debt / Debt service →

Average DSCR	**2,11**

Average of annual DSCR →

LLCR

LLCR
Loan Life
Cover Ratio

- LLCR = (NPV of CFADS over Loan Life [+DSRA]) / Debt Balance
- Covenant: ALLCR (Average) ≥ Target

  LLCR min ≥ Target (over the project life)

Cash Flow	0	1	2	3
Debt outstanding - final	180	120	60	-
Cash flow before debt	**(300)**	**138**	**137**	**143**
Actualized cash flow - y0		131	124	123
Actualized cash flow - y1			130	130
Actualized cash flow - y2				136
LLCR	**2,10**	**2,17**	**2,27**	
Average LLCR	**2,22**			

Actualization rate = 1/(1+interest rate)^years
Act. Cash flow = Act. Rate * cash flow *(For every year for the forecast)*

Sum actualized cash flow / debt final outstanding

Average of annual LLCR

Debt/Equity (1/2)

Case without distribution

Debt / Equity

- Relative proportion of **shareholders**' equity and debt used to finance a company's assets. Covenant: Debt / Equity ≤ Max D/E

D/E Calculation	0	1	2	3
Initial equity contribution	120			
Net profit	-	29	31	40
Equity + net profit	120	149	180	219
Debt outstanding - final	180	120	60	-
Debt/Equity	**1,50**	**0,81**	**0,33**	**-**
Leverage	**60,0%**	**44,7%**	**25,1%**	**0,0%**

Initial investment – debt drawdown

Yearly net profit

No distributions

Final debt outstanding / Final equity

D / (D+E)

Debt/Equity (2/2)

Case with distribution
(All the available cash flow)

D/E Calculation	0	1	2	3
Initial equity contribution	120			
Net profit	-	29	31	40
Distributions		(69)	(71)	(80)
Net equity	120	80	40	-
Debt outstanding - final	180	120	60	-
Debt/Equity	**1,50**	**1,50**	**1,50**	**n.a.**
Leverage	**60,0%**	**60,0%**	**60,0%**	**n.a.**

All cash flow after debt

Initial equity + net profit - distribution

Final debt outstanding / Final equity

D / (D+E)

Simplified example, in case it would be possible to distribute all the equity injection with no limitations. Some limitation could be set by banks or accounting rules

Summary

Lesson 4 exercise and solution

Ke – Cost of equity

WACC – Weighted average cost of capital

IRR vs Yield

Example

Exercise lesson n.2-3 – Backlog

These values should be somehow related (we will discuss during the next lessons)

Cash Flow for debt service (unlevered cash flow)	Free Cash Flow (after debt) (levered cash flow)
Discount rate 5.0%	**Discount rate 7.2%**
Project Value = 379	Equity Value = 191
As project value (enterprise value)	As equity value, net of debt !

Considering consistent discount rates (levered / unlevered)

Project Value = Equity Value + Initial outstanding debt

379 ˜ 191 + 180

Which are the right rates? **How discount rates can be consistent?**

Exercise lesson n.2-3 – Backlog

IRR calculation

By attempts changing the discount rate to get NPV=0, or using the excel formula IRR

Cash Flow	0	1	2	3
Net profit		29	31	40
D&A		100	100	100
Financial interests		9	6	3
Capex variation (-)	300			
Cash flow before debt	**(300)**	**138**	**137**	**143**
Debt drawdown	180			
Principal repayment		60	60	60
Financial interests		9	6	3
Cash flow after debt	**(120)**	**69**	**71**	**80**

Unlevered IRR = 18,4%

Levered IRR = 36,3%

Are levered and unlevered IRR satisfactory ?

Some questions

- In case of a NPV calculation, which are the **correct discount rates for levered and unlevered evaluation**?
- Are these discount rates **consistent**, and can I get the **same result, between an evaluation unlevered / levered based**?
- Which are the **right comparables** for unlevered and levered IRR (hurdle rate)?

Ke – Cost of equity

Equity IRR

- The "annualized effective compounded return rate" or rate of return that makes the net present value of the free cash flows <u>after debt service</u> equal to zero.

	Equity IRR	0	1	2	3	4	5	6	7	8	9
R	Free Cash Flow (J+L-M-E)	(84)	(112)	74	68	51	54	59	27	24	31

Equity IRR	19,7%

Is this value satisfactory?

*The answer can be given after the comparaison with the «**Ke**» or "**Re**", the minimim target rate of return for the specific project (depending on country risk, market, sector, etc.)*

Ke – Definition

- Ke is the **minimum rate of return on a project** or investment required by the sponsors (Cost if equity).
- Ke denotes **appropriate compensation for the level of risk** present; riskier projects generally have higher hurdle rates than those that are deemed to be less risky.
- For example, a company with a hurdle rate of 7%, could accept projects with higher IRR than 7%, and it would most likely accept projects with internal rate of return of 8/9%.

Ke - Calculation

- Capital Asset Pricing Model (CAPM) is applied to estimate the risk-adjusted rate for a project.
- The capital asset pricing model yields the following expected return:

$$\text{Ke} = \text{Riskfree rate} + \text{Beta} * \text{Risk premium}$$

- To use the model we need three inputs:

  Riskfree rate = The current risk-free rate

  Beta = The beta of the asset being analyzed.

  Risk premium = The expected market risk premium (the premium expected for investing in risky assets (market portfolio) over the riskless asset)

- Ke formula is univocal, while some argumentations can be behind the single factors, to identify the right values *(which riskfree, beta, risk premium to be used?)*

Ke - example

- Considering the previous case study, with a 9 years operation life and assuming as similar as the project seen during the 26/09/2016 lesson (a greenfield wind farm in Italy) the hurdle case construction could be as follows:

Ke = Riskfree rate + Beta * Risk premium

Risk free rate

- Country: Italy
- Operation life: 9 years
- Governative bond at 10 years (BTP) might be a fair approximation

BTP 10 years

Average last 2 years: 1,25%

Ke - example

Ke = Riskfree rate + Beta * Risk premium

Beta

- Beta is a measure of the volatility, or systematic risk, of a security or a portfolio in comparison to the market as a whole
- Beta is calculated using regression analysis as tendency of a security's returns to respond to swings in the market. A security's beta is calculated by dividing the covariance the security's returns and the benchmark's returns by the variance of the benchmark's returns over a specified period.
- A fair approximation could be an average of some listed companies' beta, in the same sector
- For instance, considering the renewable energy sector:

Company	Country	Market cap	Curr.	Beta Levered
EDP	Por	8.572	€	0,88
Greentech Energy Systems	DK	907	DKK	0,58
Good Energy Group PLC	UK	42	£	0,70
ENEL	Ita	38.900	€	0,96
Iberdrola	Spa	37.651	€	0,91
Erg	Ita	1.521	€	0,75
Alerion Clean Power	Ita	89	€	0,50
Falck Renewables	Ita	234	€	0,88
Verbund	Aus	2.549	€	0,68
Median				**0,75**

Reuters, 2016, October 6th

Ke - example

Ke = Riskfree rate + Beta * Risk premium

Risk Premium

- Assuming stocks as the only risky assets offered among two investment options:
  - a riskless investment (say a Government Security), on which you can make 2%
  - a mutual fund of all stocks, on which the returns are uncertain
- Some analysis are available from some different research institutes, based on a combination of statistics and surveys coming the opinion of professors, analysts, companies and financial companies.
- In the financial market Fernandez's (IESE University) and Damoradan's (NY University) analysis are used to be the references. We could take the first one:

3	Germany	5,3%	5,0%	1,7%	12,4%	1,2%	4,0%	6,0%	360
4	UK	5,3%	5,0%	1,4%	12,8%	1,5%	4,5%	6,0%	221
5	Italy	5,6%	5,5%	1,5%	10,1%	2,0%	4,8%	6,0%	152
6	Canada	5,4%	[illegible]	1,3%	10,5%	3,0%	4,6%	6,0%	127
7	Brazil	8,2%	[illegible]	4,9%	30,0%	1,8%	5,5%	8,7%	107
8	France	5,8%	5,5%	1,6%	11,4%	2,0%	5,0%	6,7%	105

Ke - example

Ke	=	Riskfree rate	+	Beta	*	Risk premium

Ke	=	1,25 %	+	0,75	*	5,5%	+	1,0%	=	6,38%

Frequently considered for taking into account a security spread and considering that comparables for beta were listed company rather than this non listed investment

Equity IRR	18,6%

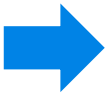
> 6,38% ✓

Is it still true if some variables change (sensitivity analysis)?

Summary

Lesson 4 exercise and solution

Ke – Cost of equity



WACC – Weighted average cost of capital

IRR vs Yield

Example

WACC

Weighted average cost of capital (WACC) is a calculation of a **firm's cost of capital** in which each category of capital is proportionately weighted.

All sources of capital, including common stock, preferred stock, bonds and any other long-term debt, are included in a WACC calculation. A firm's WACC increases as the beta and rate of return on equity increase, as an increase in WACC denotes a decrease in valuation and an increase in risk.

To calculate WACC, multiply the cost of each capital component by its proportional weight and take the sum of the results. The method for calculating WACC can be expressed in the following formula:

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

- **Tc = corporate tax rate**
- **Re = cost of equity**
- **Rd = cost of debt**
- E = equity
- D = debt

- V = E + D = enterprise value
- E/V = equity / enterprise value
- D/V = debt / enterprise value

WACC - Example

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

Cost of debt for a similar project (Irs 15 years + spread)

WACC = 28 % * 6,4% + 72% * 6,0% * (1 - 35%)

Simplification – for instance in Italy only the national tax (Ires) considers financial intersests as tax deductible

WACC = 4,6%

WACC - Example

Some differences exist between WACC and Project IRR, for instance:

- WACC is the expected average future costs of funds (from both debt and equity sources), IRR is an investment analysis technique
- WACC considers D/E ratio as fixed, while it changes during the project life

However, **WACC might be a fair approximation to compare Unlevered IRR (Project IRR)**: a project whose IRR is greater than or equal to the firm's cost of capital (WACC) should be accepted, and a project whose IRR is less than the firm's WACC should be rejected.

For the right comparison, we can take the project with zero leverage (debt free) and we can calculate the new IRR

WACC - Example

	Base Case M$	0	1	2	3	4	5	6	7	8	9
A	Revenues	0	0	270	250	300	350	364	310	322	335
B	Operation costs (Opex)	0	0	15	40	120	170	180	180	200	180
C	**EBITDA (A-B)**	**0**	**0**	**255**	**210**	**180**	**180**	**184**	**130**	**122**	**155**
D	Depreciations & Amortizations	0	0	30	50	50	50	50	50	50	0
E	EBIT (C-D)	0	0	225	160	130	130	134	80	72	155
F	Interests	0	0	0	0	0	0	0	0	0	0
G	EBT (E-F)	0	0	225	160	130	130	134	80	72	155
H	Taxes	0	0	79	56	46	46	47	28	25	54
I	**Net profit (G-H)**	**0**	**0**	**146**	**104**	**85**	**85**	**87**	**52**	**47**	**101**
C	EBITDA	0	0	255	210	180	180	184	130	122	155
H	Taxes	0	0	79	56	46	46	47	28	25	54
J	Capex / Investments	300	400	50	0	0	0	0	0	0	0
K	Working capital	0	0	0	0	0	0	0	0	0	0
L	**Cash Flow Available for Debt Service (C-H-J±K)**	**(300)**	**(400)**	**126**	**154**	**135**	**135**	**137**	**102**	**97**	**101**
M	Debt - principal initial	0	0	0	0	0	0	0	0	0	0
N	Debt drawdown	0	0	0	0	0	0	0	0	0	0
O	Principal repayment			0	0	0	0	0	0	0	0
F	Interests			0	0	0	0	0	0	0	0
P	**Debt Service (O+F)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Q	Debt balance, principal final (M+N-O)	0	0	0	0	0	0	0	0	0	0
R	**Free Cash Flow (J+L-M-E)**	**(300)**	**(400)**	**126**	**154**	**135**	**135**	**137**	**102**	**97**	**101**

WACC - Example

Project cash flow with zero leverage (debt free)

C	EBITDA	0	0	255	210	180	180	184	130	122	155
H	Taxes	0	0	79	56	46	46	47	28	25	54
J	Capex / Investments	300	400	50	0	0	0	0	0	0	0
K	Working capital	0	0	0	0	0	0	0	0	0	0
L	**Cash Flow Available for Debt Service (C-H-J±K)**	**(300)**	**(400)**	**126**	**154**	**135**	**135**	**137**	**102**	**97**	**101**

Debt free Project IRR	**8,0%**	>	4,6% ✓

Summary

Lesson 4 exercise and solution

Ke – Cost of equity

WACC – Weighted average cost of capital

IRR vs Yield

Example

Yield

Definition

The yield is the income return on an investment, such as the interest or dividends received from holding a particular security. The yield is usually expressed as an **annual percentage rate based on the investment's cost, current market value or face value.** Yields may be considered known or anticipated depending on the security in question as certain securities may experience fluctuations in value.

Yield vs IRR

- IRR (total return) expresses what an investor is expected to earn during a certain time period. It includes interest, dividends and capital gain. The time period is **all the investment life**
- Yield is more an annual concept, a kind of **annual rate** an investment is expected to return.
- Yield is frequently used to measure bond or debt performance, or in the real estate sector, while IRR is more used in private equity and infrastructural investments *(without terminal value)*

Yield vs IRR - example

Yield

Real estate property, with an annual rental

Property Value: $700,000
Annual rental income of $80,000
Yearly costs of $10,000

Yield = Annual rental – costs / property value x 100 = 10.0%

IRR

Additionally to the information above

Rental for 3 years fixed
Terminal value: $680,000

0	1	2	3
-700	70	70	750

IRR = 9.1%

Take away

- Ke: definition and relationship with levered IRR
- WACC: definition and relationship with unlevered IRR
- How to built up Ke and WACC values
- Differences between IRR and Yield

Summary

Lesson 4 exercise and solution

Ke – Cost of equity

WACC – Weighted average cost of capital

IRR vs Yield

Example

Ke and WACC calculation

With the information given in the previous exercise, starting from the discount rate for levered cash flow, we will calculate the WACC

Given

- **Ke = 7.2% (rate for levered flows)**
- **Kd = 5%**
- **Leverage (D/D+E)= 60%**
- **Tax rate = 30%**

$$WACC = \frac{E}{V} * Re + \frac{D}{V} * Rd * (1 - Tc)$$

WACC = 40 % * 7.2% + 60% * 5,0% * (1 - 30%)

WACC = 4.98%

In the exercise (lesson 2/3), by using an unlevered rate of 5.0% we got a consistent result between Unlevered and Levered evaluation. This is the prove that **if Ke and WACC are consistent, also the evaluation should be consistent**

Annex

Modelling working capital (VAT Credit)

Construction cost + VAT

Considering a construction investment of 100 M€ + 22% VAT (20 M€) at year 0.

Operation starts at year 2, when VAT credit is expected to be refunded.

Assuming a project life of 20 years, 20 M€ as yearly revenues and 10 M€ as yearly opex, without VAT, tax rate 30% on Ebt

P&L	0	1	2
Revenues			
Costs			
Ebitda		-	-
D&A			
Ebit		-	-
Financial interests		-	-
Ebt		-	-
Tax		-	-
Net profit		**-**	**-**

Balance sheet	0	1	2
Assets			
Property, plant & equipment			
Cash and associated			
Working capital			
Receivables			
Payables			
VAT credit			
Financial investments			
Other assets			
Total Assets		-	-
Liabilities			
Equity			
Shareholder loans			
Financial debt			
Other liabilities			
Total liabilities		-	-

Construction cost + VAT – first step

First step – year 0

construction investment of 100 M€ = new asset

22% VAT (20 M€) at year 0 = VAT credit

Balance sheet	0	1	2
Assets			
Property, plant & equipment	100		
Cash and associated			
Working capital			
Receivables			
Payables			
VAT credit	20		
Financial investments			
Other assets			
Total Assets	**120**	**-**	**-**
Liabilities			
Equity	120		
Shareholder loans			
Financial debt			
Other liabilities			
Total liabilities	**120**	**-**	**-**

Construction cost + VAT – first step

First step – year 0

Cash flow construction

Assets	
Property, plant & equipment	100
Cash and associated	
Working capital	
Receivables	
Payables	
VAT credit	20
Financial investments	
Other assets	
Total Assets	**120**

Cash flow		0
Ebitda (+)		-
Tax (-)		
Investments (-)		(100)
VAT credit increase (-)		(20)
VAT credit decrease (-)		-
Cash flow before debt = cash flow after debt		**(120)**

Liabilities	
Equity	120
Shareholder loans	
Financial debt	
Other liabilities	
Total liabilities	**120**

Construction cost + VAT – second step

Second step – year 1 and 2

Revenues, costs and D&A

P&L		0	1	2
Revenues			20	20
Costs			10	10
Ebitda			10	10
D&A			5	5
Ebit			5	5
Financial interests			-	-
Ebt			5	5
Tax			2	2
Net profit			**4**	**4**

Cash flow	0	1	2
Ebitda (+)	-	10	10
Tax (-)		(2)	(2)

Construction cost + VAT – third step

Third step – year 1 and 2

Vat refund

Assets			
Property, plant & equipment	100	95	90
Cash and associated			
Working capital			
Receivables			
Payables			
VAT credit	20		
Financial investments			
Other assets			
Total Assets	**120**	**95**	**90**

Cash flow	0	1	2
Ebitda (+)	-	10	10
Tax (-)		(2)	(2)
Investments (-)	(100)	-	-
VAT credit increase (-)	(20)	-	-
VAT credit decrease (-)	-	20	-
Cash flow before debt = cash flow after debt	**(120)**	**29**	**9**

Construction cost + VAT – final result

P&L	0	1	2
Revenues		20	20
Costs		10	10
Ebitda		10	10
D&A		5	5
Ebit		5	5
Financial interests		-	-
Ebt		5	5
Tax		2	2
Net profit		**4**	**4**

Cash flow	0	1	2
Ebitda (+)	-	10	10
Tax (-)		(2)	(2)
Investments (-)	(100)	-	-
VAT credit increase (-)	(20)	-	-
VAT credit decrease (-)	-	20	-
Cash flow before debt = cash flow after debt	**(120)**	**29**	**9**

Balance sheet	0	1	2
Assets			
Property, plant & equipment	100	95	90
Cash and associated			
Working capital			
Receivables			
Payables			
VAT credit	20		
Financial investments			
Other assets			
Total Assets	**120**	**95**	**90**
Liabilities			
Equity	120	95	90
Shareholder loans			
Financial debt			
Other liabilities			
Total liabilities	**120**	**95**	**90**