

**INTERNATIONAL FINANCE
FINANCIAL MODEL
Lesson 10
Risk analysis and exercises**

LUISS Guido Carli

Academic Year: 2018/2019

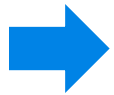
November 26th

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Summary



Excercise D - solution

Some characteristics and notes to remember of project finance

Take out of financial modelling part

Excercise D (assignment)

Project

- People mover, one-to-one electric transportation system from the city center to the city airport of a primary city. The project is running and fully operating
- The project package means the project rights (authorization for the use of the line in a monopoly system) and the necessary tools to operate the system (trains, stations, devices, etc.)

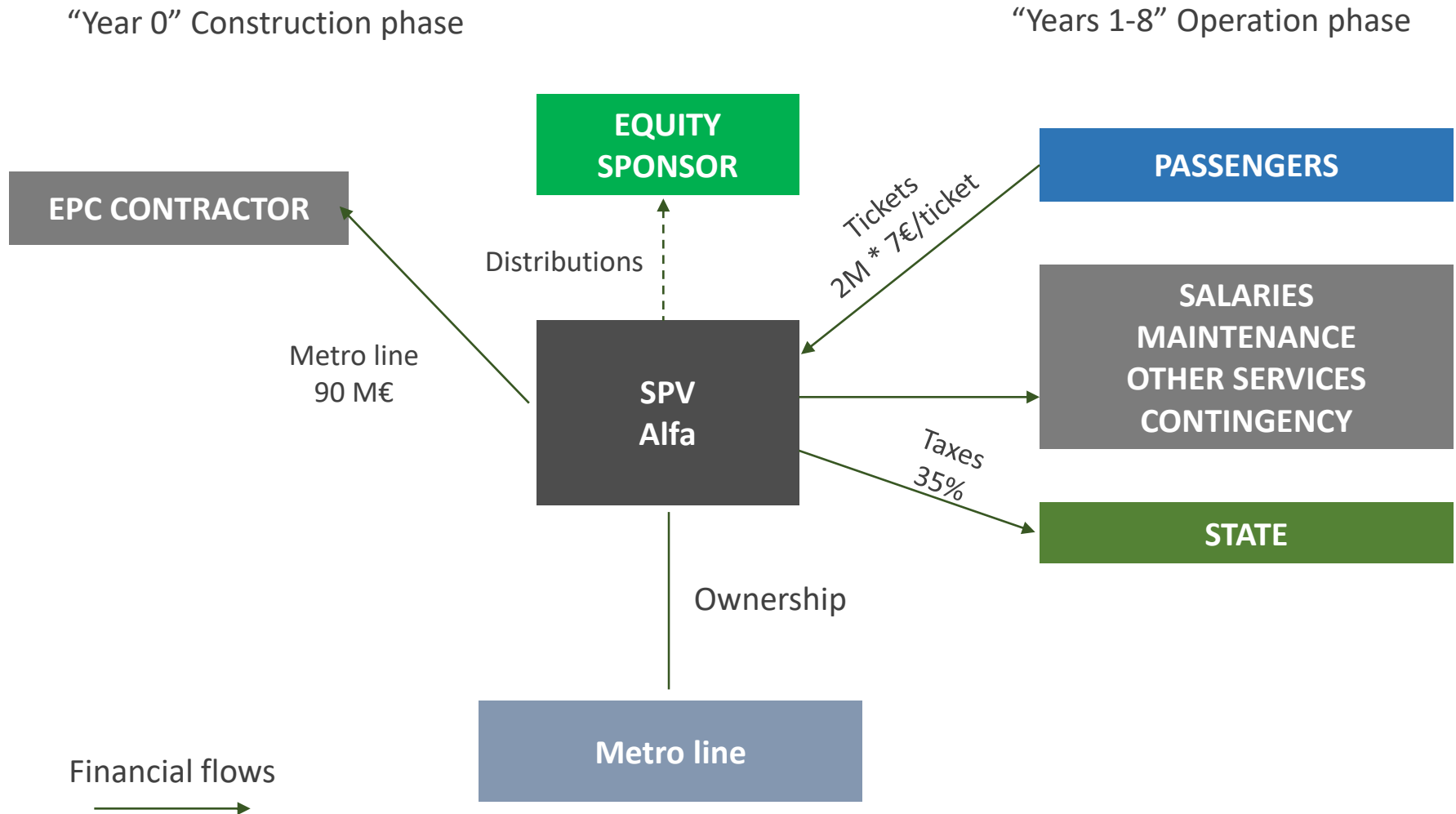
Input

- **CAPEX:** Initial asset book value: 90 M€ (price to be considered), asset remaining life 30 years, amortization rate 1/30 yearly; investment period 8 years; At the end of the investment period, the asset is sold at its residual book value
- **REVENUES:** Drivers are yearly passenger and ticket per passenger, Passengers are expected of 2.0 M per year (*2.0 M tickets*), Price per ticket is 7 € per ticket, with an yearly adjustment according to inflation rate
- **OPERATING COSTS:** Salaries 0.5 M€/year, Maintenance 1 M€/year, other services and general expenses: 2 M€/year, Contingency of 5% of the annual costs. All the previous costs adjusted according to the inflation rate
- **OTHER ASSUMPTIONS:** Inflation rate: annual 2% (according to historical value and market forecast, Tax rate: flat 35% on the annual EBT, No leverage, the project has to be considered full equity (debt free)

TO DO

- **Draw the business plan (profit & losses, cash flow) with the previous assumptions**
- **Identify some possible risks and the related effects**

Excercise D – business model



Exercise D - assignment

- Based on exercise D, identify the maximum leverage allowed to respect the following covenant: $\text{min DSCR} > 1.3x$,
under the following conditions: interest rate: 5%, duration 8 years
- Based on the 3 main risks previously identified, build up a risk matrix and sensitivity analysis, referring to lesson 8

First try – debt repayment

- First try: leverage of 50% (fixed debt service)

Debt repayment M€	0	1	2	3	4	5	6	7	8
Leverage		50,0%							
Tenor (duration) - years		8,0							
Interes rate		5,0%							
Initial outstanding debt	45								
Yearly debt service	7								
Initial outstanding debt		45	40	35	30	25	19	13	7
Debt drawdown	45								
Debt service		7	7	7	7	7	7	7	7
Financial interests		2	2	2	2	1	1	1	0
Capital repayment		5	5	5	5	6	6	6	7
Final outstanding debt	45	40	35	30	25	19	13	7	0

First try – P&L and cash flow

P&L M€	0	1	2	3	4	5	6	7	8
Revenues	0,0	14,0	14,3	14,6	14,9	15,2	15,5	15,8	16,1
Operation costs (Opex)	0,0	3,7	3,7	3,8	3,9	4,0	4,1	4,1	4,2
EBITDA (A-B)	0,0	10,3	10,5	10,7	11,0	11,2	11,4	11,6	11,9
Depreciations & Amortizations	0,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
EBIT (C-D)	0,0	7,3	7,5	7,7	8,0	8,2	8,4	8,6	8,9
Interests		2,3	2,0	1,8	1,5	1,2	0,9	0,6	0,3
EBT (E-F)	0,0	5,1	5,5	6,0	6,5	6,9	7,5	8,0	8,5
Taxes	0,0	1,8	1,9	2,1	2,3	2,4	2,6	2,8	3,0
Net profit (G-H)	0,0	3,3	3,6	3,9	4,2	4,5	4,8	5,2	5,5

Base Case M€	0	1	2	3	4	5	6	7	8
EBITDA	0,0	10,3	10,5	10,7	11,0	11,2	11,4	11,6	11,9
Taxes	0,0	(1,8)	(1,9)	(2,1)	(2,3)	(2,4)	(2,6)	(2,8)	(3,0)
Asset investment	(90,0)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Asset sale	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	66,0
Working capital	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cash Flow before debt	(90,0)	8,6	8,6	8,7	8,7	8,7	8,8	8,8	74,9

Debt drawdown	45	0	0	0	0	0	0	0	0
Financial interests	0	(2)	(2)	(2)	(2)	(1)	(1)	(1)	(0)
Capital repayment	0	(5)	(5)	(5)	(5)	(6)	(6)	(6)	(7)
Cash flow after debt	(45,0)	1,6	1,6	1,7	1,7	1,8	1,8	1,9	67,9

Cash flow before debt		8,6	8,6	8,7	8,7	8,7	8,8	8,8	74,9
Debt service		7,0	7,0	7,0	7,0	7,0	7,0	7,0	7,0
DSCR		1,23	1,24	1,24	1,25	1,26	1,26	1,27	10,75

IRR Levered: 8.2%

low leverage effect as the leverage is not very high. Usually investment life and loan duration are longer and allow a higher leverage


Min DSCR = 1.23x < 1.30x

*No respected the covenant of 1.30x
Leverage has to be reduced*

Solution – debt repayment

Debt repayment M€	0	1	2	3	4	5	6	7	8
Leverage									
Tenor (duration) - years									
Interest rate									
Initial outstanding debt	41								
Yearly debt service	6								
Initial outstanding debt		41	37	33	28	23	17	12	6
Debt drawdown	41								
Debt service		6	6	6	6	6	6	6	6
Financial interests		2	2	2	1	1	1	1	0
Capital repayment		4	5	5	5	5	6	6	6
Final outstanding debt	41	37	33	28	23	17	12	6	0

46,0%
8,0
5,0%



Solution – debt repayment

P&L M€	0	1	2	3	4	5	6	7	8
Revenues	0,0	14,0	14,3	14,6	14,9	15,2	15,5	15,8	16,1
Operation costs (Opex)	0,0	3,7	3,7	3,8	3,9	4,0	4,1	4,1	4,2
EBITDA (A-B)	0,0	10,3	10,5	10,7	11,0	11,2	11,4	11,6	11,9
Depreciations & Amortizations	0,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
EBIT (C-D)	0,0	7,3	7,5	7,7	8,0	8,2	8,4	8,6	8,9
Interests		2,1	1,9	1,6	1,4	1,1	0,9	0,6	0,3
EBT (E-F)	0,0	5,3	5,7	6,1	6,6	7,0	7,5	8,0	8,6
Taxes	0,0	1,8	2,0	2,1	2,3	2,5	2,6	2,8	3,0
Net profit (G-H)	0,0	3,4	3,7	4,0	4,3	4,6	4,9	5,2	5,6

IRR Levered: 8.0%

Min DSCR = 1.33x > 1.30x

Please pay attentions to decimals: with 47% leverage, min DSCR seemed ok (rounded to 1.30x), but with more decimals it was 1.299x (<1.30x)

Base Case M€	0	1	2	3	4	5	6	7	8
EBITDA	0,0	10,3	10,5	10,7	11,0	11,2	11,4	11,6	11,9
Taxes	0,0	(1,8)	(2,0)	(2,1)	(2,3)	(2,5)	(2,6)	(2,8)	(3,0)
Asset investment	(90,0)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Asset sale	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	66,0
Working capital	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Cash Flow before debt	(90,0)	8,5	8,5	8,6	8,7	8,7	8,8	8,8	74,9
Debt drawdown	41	0	0	0	0	0	0	0	0
Financial interests	0	(2)	(2)	(2)	(1)	(1)	(1)	(1)	(0)
Capital repayment	0	(4)	(5)	(5)	(5)	(5)	(6)	(6)	(6)
Cash flow after debt	(48,6)	2,1	2,1	2,2	2,3	2,3	2,4	2,4	68,5

Pay attention

General risks (general list)

Construction and operation

- Delay in construction
- Lower performances
- Higher degradation
- Higher operating costs
- Extraordinary maintenance
- Default during construction
- Default during operation

Political / country risk

- Delay in construction
- Change in law
- Tax rate change

Supply and Market

- Higher construction budget
- Lower revenue drivers
- Higher operation costs
- Commodity price

Economical and Financial

- Different inflation rate
- Different financial conditions
- Higher interest rate

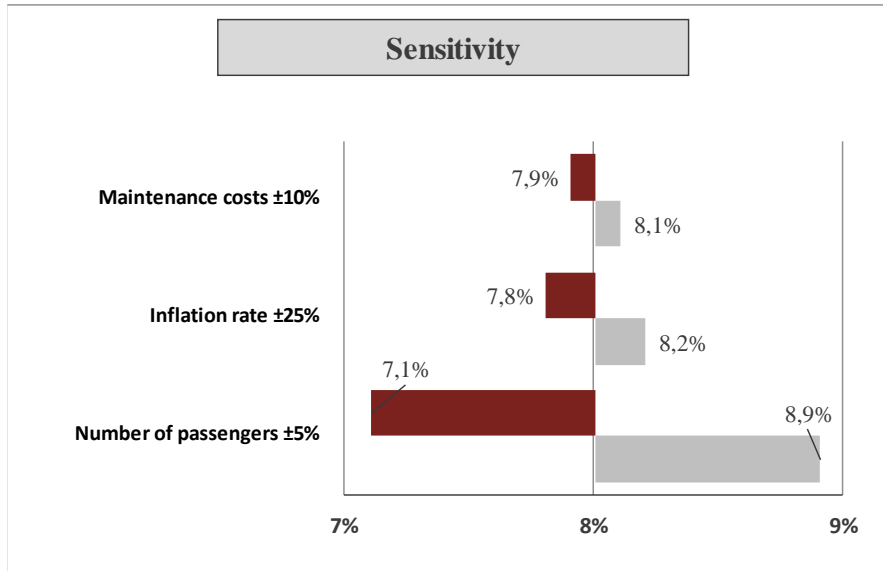
Some project risks

Market / number of passengers
Inflation rate variation
Maintenance costs } chosen
Technological risks / Insurance costs
Tax rate variation
[...]

Risk matrix and sensitivity

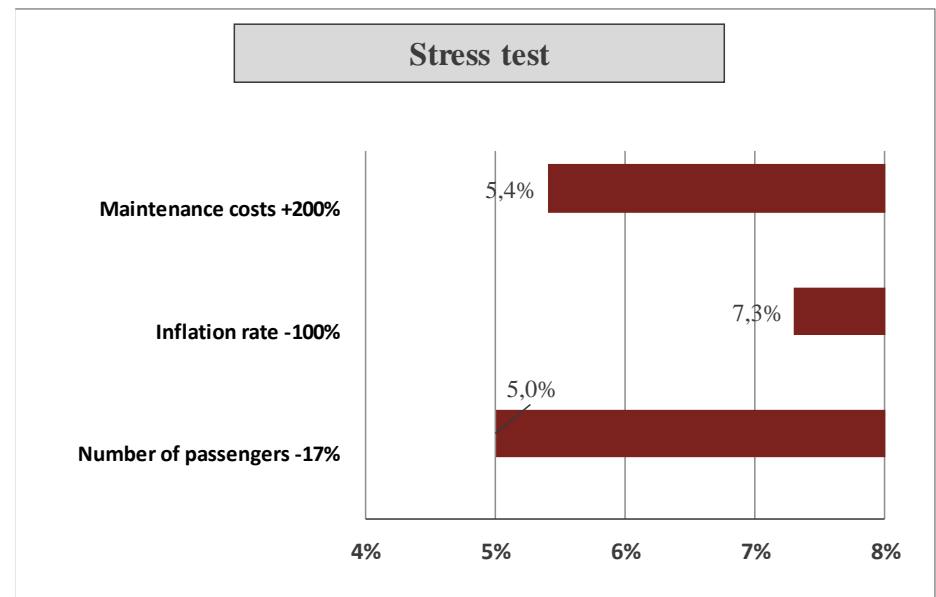
Risk area	Risk	Description	Base case	Possible variation Unit	IRR variation	Possible Mitigation
Supply and market	Number of passengers	Less (or more) passengers than expected	2 M/year	±5%	±0.9%	<ul style="list-style-type: none"> • Guarantee from the airport/municipality of a minimum number of passenger (to be negotiated)
Economical and Financial	Inflation rate	Less (or more) inflation rate than expected	2.0%	±25%	±0.2%	<ul style="list-style-type: none"> • No mitigation
Construction and operation (or also supply and market)	Maintenance costs	More (or less) operation costs than expected	1 M/year	±10%	±0.1%	<ul style="list-style-type: none"> • Long term and turn key maintenance contract • Reliable counterpart

Sensitivity and Stress test



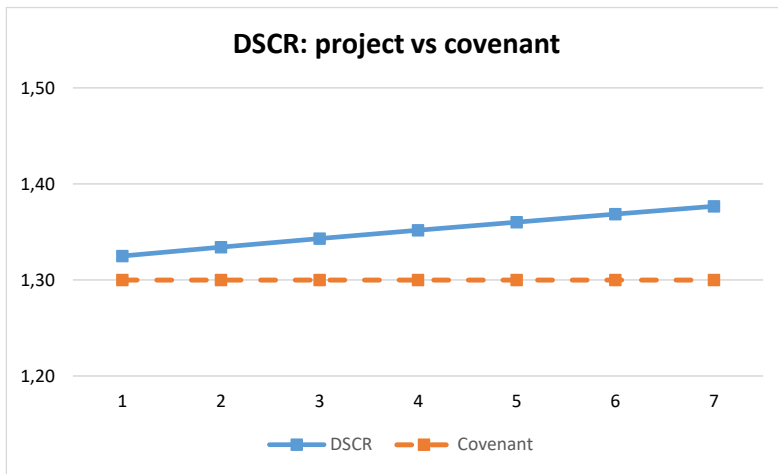
Different IRR by changing variables according to the previous risk matrix
 We can expect a strong relationship IRR – number of passengers

Considering an hurdle rate (K_e) of 5.0%, maximum variation of the variables to satisfy $IRR > K_e$
 Even with inflation rate = 0%, IRR is still $> K_e$

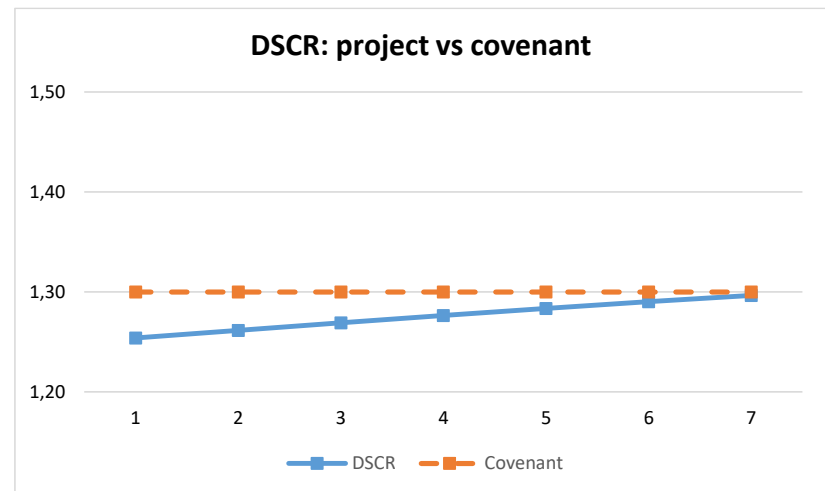


DSCR

BASE CASE: no variations



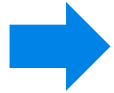
SENSITIVITY: with -5% yearly passengers



With a small variation of yearly passengers, even if levered IRR is still positive ($>K_e$), financial covenant (min DSCR) is not satisfied

Summary

Excercise D - solution



Some characteristics and notes to remember of project finance

Take out of financial modelling part

Introduction

- Some considerations to have in mind before **building up a financial model, that can have an impact on the project valuation, project structure and leverage**
- Please refer to slide 15 of lesson 9 (November 12th) to identify the importance of considering several factors (in that specific case the distributions rules)
- The next slides will deepen some circumstances to avoid: **dividend trap** and **negative equity**

Back log of lessons Prof. Merola November 19th and 23th

Dividend trap

Dividend trap: a company (SPV) is able to generate enough cash, not available for distribution to its shareholder

- In project finance transaction, for instance by breaking the debt/equity covenant
- A possible cause could be an accelerated depreciation (for instance using a rate of 20%, rather than 10% with a 15y loan)
- With a dividend trap, there is a mismatching between SPV's cash flow and shareholders' cash flow, reducing shareholders' IRR
- Recourse to subordinated debt, especially with remuneration, can reduce this effect

Dividend trap

Example

	Base Case M\$	0	1	2	3	4	5	6	7	8	9
A	Revenues	0	0	270	250	300	300	300	300	322	335
B	Operation costs (Opex)	0	0	15	40	120	120	120	120	200	180
C	EBITDA (A-B)	0	0	255	210	180	180	184	130	122	155
D	Depreciations & Amortizations			165	165						
E	EBIT (C-D)	0	0	90	45	180	180	184	130	122	155
F	Interests	0	0	32	28	24	20	16	12	8	4
G	EBT (E-F)	0	0	58	17	156	160	168	118	114	151
H	Taxes	0	0	20	6	54	56	59	41	40	53
I	Net profit (G-H)	0	0	37	11	101	104	109	77	74	98
C	EBITDA	0	0	255	210	180	180	184	130	122	155
H	Taxes	0	0	20	6	54	56	59	41	40	53
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)	185	204	180	180	184	130	122	102
M	Debt - principal initial	0	216	504	473	405	338	270	203	135	68
N	Debt drawdown	216	288	36	0	0	0	0	0	0	0
O	Principal repayment			68	68	68	68	68	68	68	68
F	Interests			32	28	24	20	16	12	8	4
P	Debt Service (O+F)	0	0	100	96	92	88	84	80	76	72
Q	Debt balance, principal final (M+N-O)	216	504	473	405	338	270	203	135	68	18 0
R	Free Cash Flow (J+L-M-E)	(84)	(112)	121	108	34	36	41	9	7	31

D&A in 2 years rather than 8 years as in the base case

In the first 2 years, low net profit with high cash flow. Not all the cash flows could be distributable to the shareholders

Negative equity

- A possible solution to avoid dividend trap issues, could be the use of **subordinated debt**.
- However, using it could cause issues of **negative equity, especially if the subordinated debt is remunerative**
- Interest on subordinated debt is a cost that could generate losses, especially in the first years of operation when the financial interests of the debt principal are high
- In an extreme situation, losses could be covered by sponsors' capital
- **The right match between IRR and balance sheet evaluation should lead to the optimal capital structure for a specific project**

Negative equity Example

Assuming the 100% of the capital need (after debt drawdown) with a subordinated debt with 10% interest rate

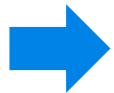
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B	Operation costs (Opex)	0	0	100	110	120	180	180	200	180	
C	EBITDA (A-B)	0	0	170	140	180	184	130	122	155	
D	Depreciations & Amortizations			165	165						
E	EBIT (C-D)	0	0	5	(25)	60	180	184	130	122	155
F	Interests	0	0	32	28	24	20	16	12	8	4
	Interests on subordinated debt			21	21	21	21	21	21	21	21
G	EBT (E-F)	0	0	(48)	(74)	135	139	147	97	93	130
H	Taxes	0	0	(17)	(26)	47	49	51	34	33	46
I	Net profit (G-H)	0	0	(31)	(48)	88	90	95	63	61	85

Losses during the first two years of operation

Summary

Excercise D - solution

Some characteristics and notes to remember of project finance



Take out of financial modelling part

Main topics

Financial model

Being able to draw a simple financial model from some identified input

- Profit & Losses structure
- Cash Flow structure (before/after debt)
- Some good practise for financial modelling

Different model architectures

Different approach in project and project evaluation

- Corporate model
- Project finance model
- (Leverage buyout model)
- (Integration model)

Sponsor and Lender ratios

Starting from a defined model, assessing the main ratios for project evaluation

- Sponsor Ratios: IRR, NPV, Payback
- Lender Ratios: DSCR, LLCR, D/E
- Comparables: K_e , WACC
- Discounted Cash Flow
- Yield vs IRR

Sensitivity and Risk analysis

Identify, evaluate and eventually mitigate possible risk factor

- Risk matrix
- Sensitivity
- Scenario analysis
- Stress test

**Yet to be
discussed**

P&L and Balance Sheet

P&L

- (+) Revenues
- (-) Operating Costs
- (=) **EBITDA**
- (-) D&A – depreciation and amortization
- (=) Ebit (*earnings before interests and taxes*)
- (-) Interests
- (=) Ebt (*earnings before taxes*)
- (-) Taxes
- (=) **Net Profit**

ASSETS

Property, plant & equipment

(Capex/investments)

Cash and associated

Working capital

(+) Receivables, (-) Payables, (±) VAT/tax credit/debit, etc.

Financial investments

Other assets

LIABILITIES

Equity and retained earnings

Shareholder loans

Financial debts (*loans, etc.*)

Other liabilities

Cash Flow Available for Debt Service

From Net Profit

From Ebitda

(+) Net Profit

(+) D&A

(+) Financial Interests

(-) Investments (disinvestments)

(+/-) Working capital variation

(=) Cash Available for Debt Service

(+) Debt increase (drowdown)

(-) Principal variation

(-) Financial interests

(-) Other debt related expenses / flows (commissions, agency fee, DSRA)

(=) Free Cash Flow

[Distribution rules]

(=) Cash Flow for the shareholders

(+) Ebitda

(-) Taxes

(-) Investments (disinvestments)

(+/-) Working capital variation

(=) Cash Available for Debt Service

Levered vs Unlevered evaluation

**Cash Flow before debt service
(unlevered cash flow)**

**Free Cash Flow (after debt)
(levered cash flow)**

- Unlevered IRR
- Unlevered NPV
- Unlevered payback (simple and actualized)
- Levered IRR
- Levered NPV
- Levered payback (simple and actualized)

Enterprise Value = Equity Value + Net debt (-cash)

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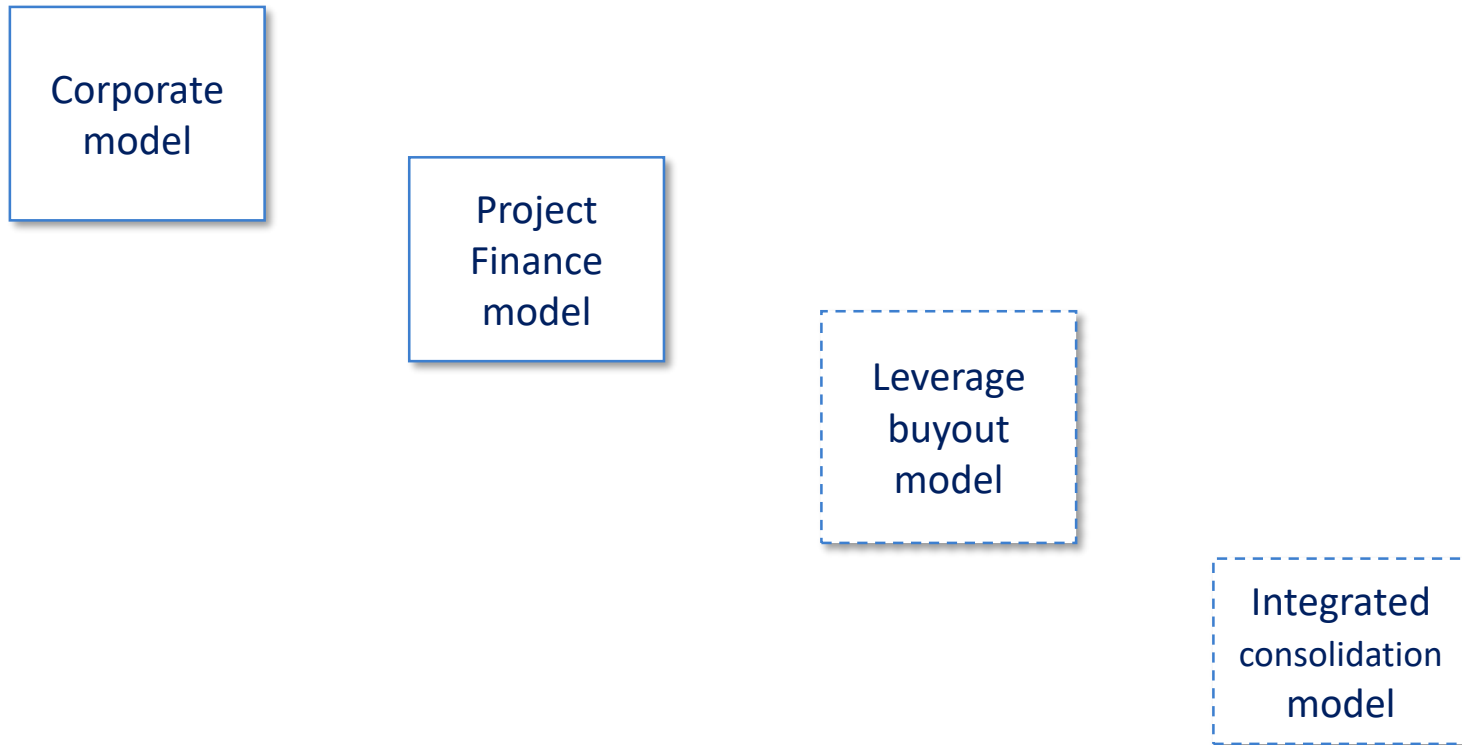
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FINANCIAL MODEL

Different architectures



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Different perspectives: Lender vs Sponsor

Different perspectives according to different roles, strategies and risk profiles

Risk based remuneration
Sensitivity analysis
Multiple Scenario

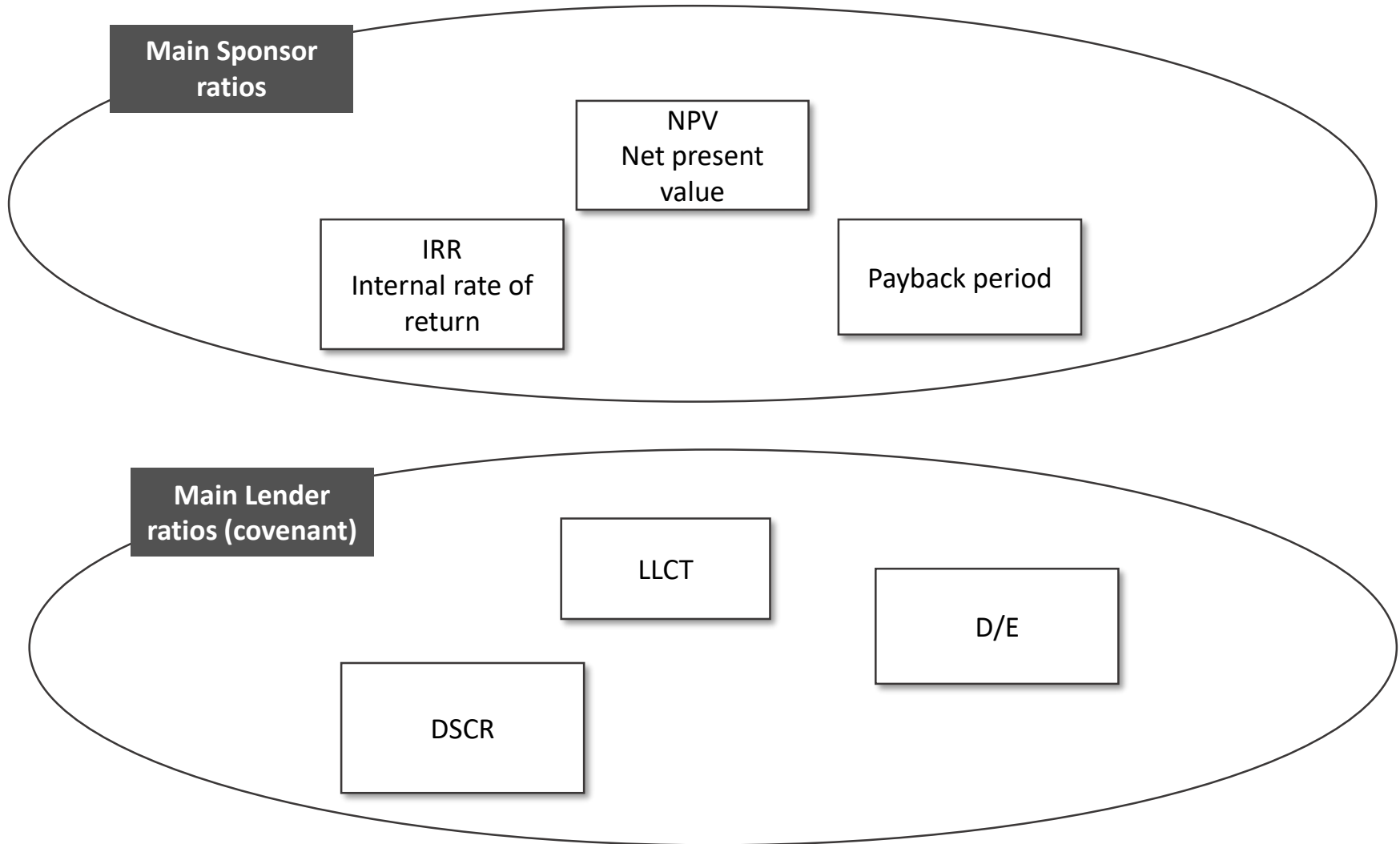


Lower remuneration
Lower risk
Stress test to avoid default

Ratio
(IRR, ROE, NPV, EPS)
DCF, Payback period

Covenant
(DSCR, LLCR, D/E)
Stress test

Main Sponsor and Lender's ratios



Comparables

LEVERED FLOWS

$$K_e = \text{Riskfree rate} + \text{Beta} * \text{Risk premium} + [\text{Additional premium}]$$

UNLEVERED FLOWS

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

Other definitions

- **Discounted Cash Flow (DCF)** is a valuation method used to estimate the **attractiveness of an investment opportunity**.

$$DCF = \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_n}{(1+r)^n}$$

CF = Cash Flow

Cost of equity required by the sponsors \approx hurdle rate

- The **yield** is the income return on an investment, such as the interest or dividends received from holding a particular security.
- **Different repayment methods for loans**: fixed capital repayment, fixed debt service, DSCR profiled

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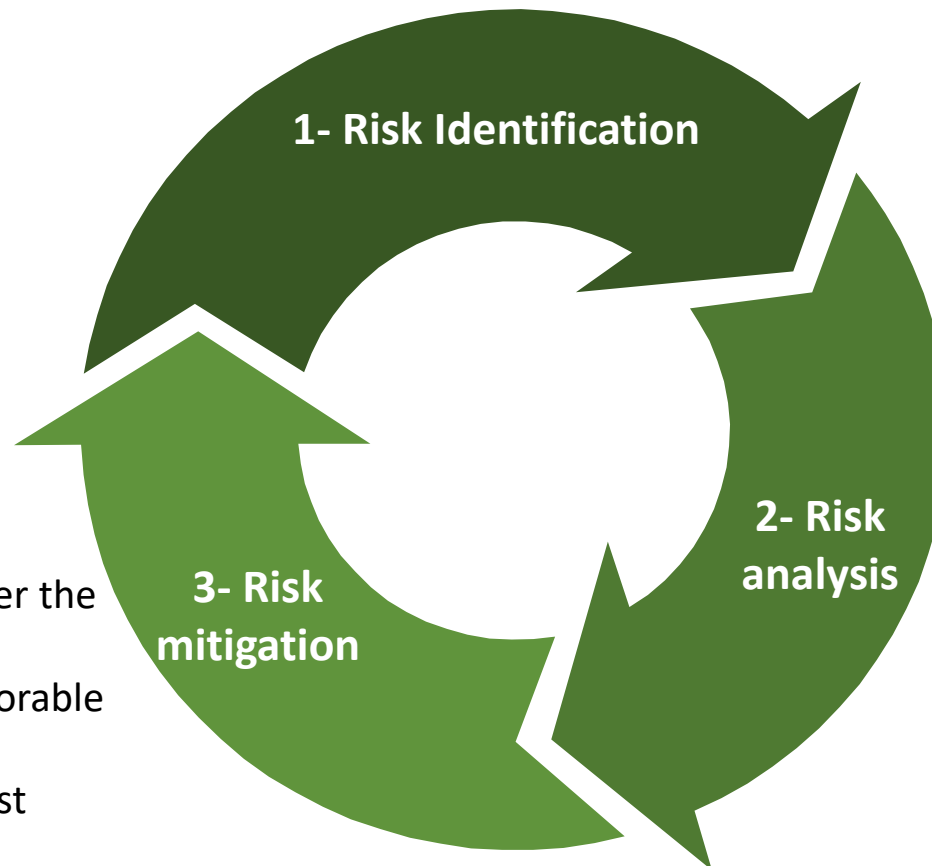
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Risk management

- Which are the main project risks?
- Which could be a possible variation depending on the project risk?



- Is it necessary to cover the risk?
- Is it economically favorable to have a coverage
- Sensitivity / Stress test

- Which is the economic impact on my business plan?

Some main risks

Construction and operation

- Delay in construction
- Lower performances
- Higher degradation
- Higher operating costs
- Extraordinary maintenance
- Default during construction
- Default during operation

Political / country risk

- Delay in construction
- Change in law
- Tax rate change

Supply and Market

- Higher construction budget
- Lower revenue drivers
- Higher operation costs
- Commodity price

Economical and Financiale

- Different inflation rate
- Different financial conditions
- Higher interest rate

Risk analysis and mitigation

Risk matrix

Perform
sensitivity
analysis

Perform stress
test analysis

Identify and
evaluate
mitigants