INTERNATIONAL FINANCE
FINANCIAL MODEL
Lesson 3

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Summary

- Lesson 2 exercise references and solution
- The leverage effect and DCF
- Different structures: corporate vs project finance
- New exercise

Exercise

1) Please calculate the project value (unlevered) and the equity value (levered) using the discounted cash flow method, and considering:

- Discount rate for unlevered cash flow: 5.0%
- Discount rate for levered cash flow: 7.2%

2) Please calculate IRR and payback period (levered and unlevered), considering two additional inputs:

- An initial investment at year 0 as cash out for the asset of 300 M€
- An initial debt drawdown at year 0 of 180 M€. Do not consider any financial interests during year 0

Exercise – Solution question 1

P&L	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	1	2	3
Net profit	29	31	40
D&A	100	100	100
Financial interests	9	6	3
Tax benefit (-)			
Cash flow before debt	**138**	**137**	**143**
Principal repayment	60	60	60
Financial interests	9	6	3
Cash flow after debt	**69**	**71**	**80**

Cash Flow for debt service (unlevered cash flow)

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

Exercise – Solution question 1

Cash Flow for debt service

(unlevered cash flow)

Discount rate for unlevered cash flow: 5.0% (k)

Cash Flow	1	2	3
Net profit	29	31	40
D&A	100	100	100
Financial interests	9	6	3
Tax benefit (-)			
Cash flow before debt	**138**	**137**	**143**

1 / (1+k)^year →

Actualization rate	95,2%	90,7%	86,4%

Cash flow before debt / actualization rate →

Actualized cash flow	131	124	123

Σ actualized cash flow →

NPV	**379**

Or with excel: NPV(discount rate; cash flows)

Exercise – Solution question 1

Free Cash Flow (after debt)

(levered cash flow)

Discount rate for levered cash flow: 7.2% (j)

Cash Flow	1	2	3
Cash flow before debt	**138**	**137**	**143**
Principal repayment	60	60	60
Financial interests	9	6	3
Cash flow after debt	**69**	**71**	**80**

1 / (1+j)^year →

Actualization rate	93,3%	87,0%	81,2%

Cash flow after debt / actualization rate →

Actualized cash flow	64	62	65

Σ actualized cash flow →

NPV	**191**

Or with excel: NPV(discount rate; cash flows)

Exercise – Solution question 1

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)
Project Value = 379	Equity Value = 191
As project value (enterprise value)	As equity value, net of debt !

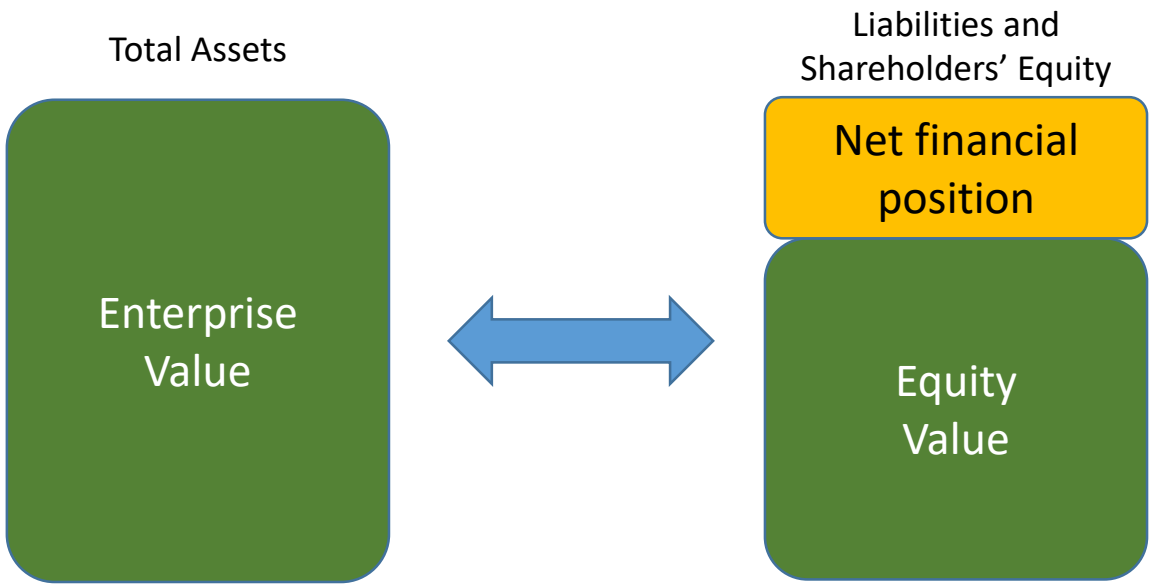
Considering consistent discount rates (levered / unlevered)

Project Value = Equity Value + Initial outstanding debt

379 ˜ 191 + 180

How discount rates can be consistent?

Equity Value vs Enterprise Value



Enterprise Value = **Net financial position** *(net debt – cash)* + **Equity Value**

DISCOUNT RATE

WACC

CAPM (Ke)

To be discussed next lessons

Exercise – Solution question 2

2) Please calculate IRR and payback period (levered and unlevered), considering two additional inputs:

- An initial investment at year 0 as cash out for the asset of 300 M€
- An initial debt drawdown at year 0 of 180 M€. Do not consider any financial interests during year 0

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**

New investment 300

Net profit + D&A + Interests - Capex

New debt 180

Cash flow before debt + drawdown – repayment - interests

Exercise – Solution question 2

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%

Exercise – Solution question 2

Payback calculation (unlevered case)

Cash Flow	0	1	2	3
Cash flow before debt	**(300)**	**138**	**137**	**143**
Cumulated cash flow	(300)	(162)	(26)	117
Actualization rate	100,0%	95,2%	90,7%	86,4%
Actualized cash flow	(300)	131	124	123
Cumulated cash flow	(300)	(169)	(45)	79

Σ Cash flow before debt →

Between year 2 and 3
Very close to year 2

As calculated before →

Σ Actualized Cash flow →

Between year 2 and 3

Exercise – Solution question 2

Payback calculation (levered case)

Cash Flow	0	1	2	3
Cash flow after debt	**(120)**	**69**	**71**	**80**
Cumulated cash flow	(120)	(51)	20	99
Actualization rate	100,0%	93,3%	87,0%	81,2%
Actualized cash flow	(120)	64	62	65
Cumulated cash flow	(120)	(56)	6	71

Σ Cash flow after debt

Between year 1 and 2
Closer to year 2

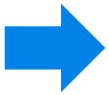
As calculated before

Σ Actualized Cash flow

Between year 1 and 2
Very close to year 2

Summary

Lesson 2 exercise references and solution



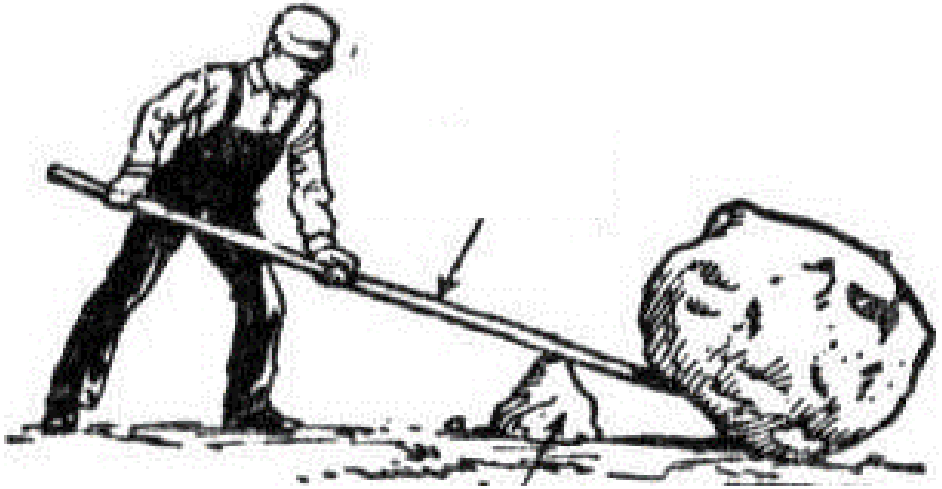
The leverage effect and DCF

Different structures: corporate vs project finance

New exercise

The leverage effect

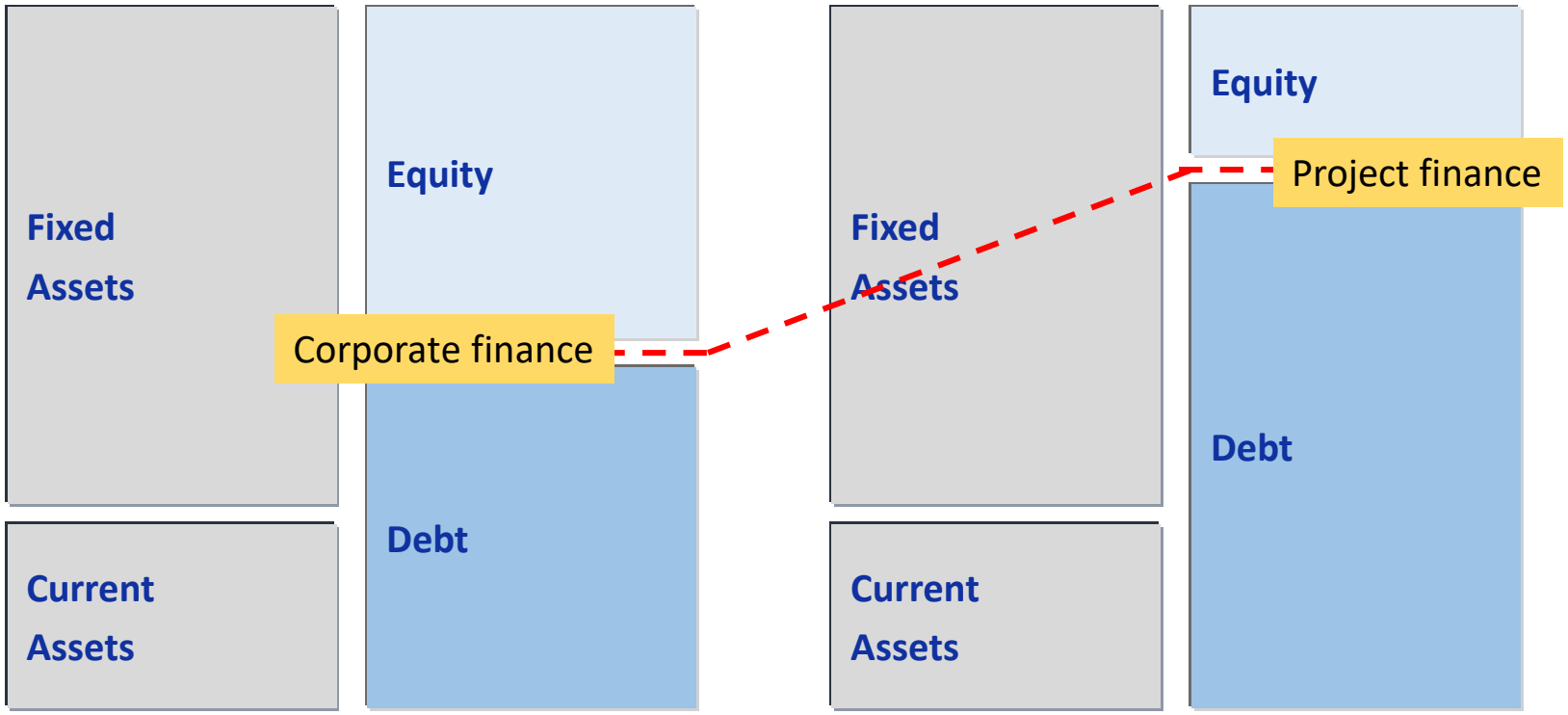
Under some specific conditions projects can take benefit from leverage.
However, some other factors have to take into consideration



ROI (unlevered IRR) > net interest rate → Leverage can increase the return

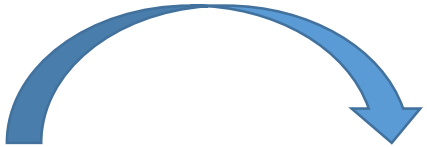
ROI (unlevered IRR) < net interest rate → Leverage is negative for the return

How the leverage can have impact on IRR?



- Usually target IRR and debt interest rate have different values, where the first should be higher than the latter
- In the next exercise, we will analyze the possible benefit of the leverage, and its limits

Leverage: example (simplification)



Unlevered case

Year	0	1	2	3
Ebitda		40	40	40
Capex	-100			
Cash flow	-100	40	40	40

Investment	100
Unlevered IRR	10%
Total gain	20

With 60% leverage, with the same investment (100), it is possible to invest 2.5 times (100 equity + 150 debt)

Interest rate 4%

Levered case

Year	0	1	2	3
Ebitda		100	100	100
Capex	-250			
Debt oustanding	150			
Debt repayment		-50	-50	-50
Interests		-6	-4	-2
Cash flow	-100	44	46	48

Investment	100
Levered IRR	18%
Total gain	38

Leverage is an IRR multiplier
(interest rate < IRR unlevered)

Some evaluation metodologies

Discounted Cash Flow (DCF)	• Forecast the free cash flow for many years ahead • Discount it back to today at an appropriate cost of capital *(dependent on the hurdle rate)* • Dividend discount if the analysis is done on the dividends itself • Crossing methodology: for corporate evaluation, but also for M&A in operating assets *(also in project finance)*
Market based (Multiples)	• Multiples of some index, by sectorial multiples • i.e. After-tax profits multiplied by appropriate price/earnings ratio • i.e. EBIT or EBITDA multiplied by appropriate ratios
(Net assets based)	• Based on equity in the balance sheet. • May reflect revaluation of assets, or assets at replacement price, or liquidation values.

Discounted Cash Flow Method

Starting point:

1. Free Cash Flows
2. Discount rate
3. [Terminal value]

- Growth rate or expected operating flows
- Market changes
- Macro-economic changes
- Change in law
- Change in the financial structure
- Turnaround Cases

- Equivalent to liquidation/sale value
- Value of the cash flows after the forecast period
- Methods - Perpetual Growth & Multiple Approach

DCF – Two ways – same (similar) result

Unlevered based

- Starting from the unlevered cash flow (debt free)
- WACC as discount rate
- **Enterprise Value** as result (Enterprise Value = Market value of operating assets)
- Equity Value = Enterprise Value - Initial outstanding debt
- [With terminal value evaluation]

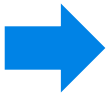
Levered Based

- Starting from levered cash flow
- **Hurdle rate (Ke)** as discount rate
- **Equity Value** as result (Equity Value = the Value of a firm's equity - for listed companies market capitalization, calculated by multiplying the market value per share by the total number of shares outstanding).
- [With terminal value evaluation net of final outstanding debt]

Summary

Lesson 2 exercise references and solution

The leverage effect and DCF



Different structures: corporate vs project finance

New exercise

FINANCIAL MODEL
Different architectures

Corporate model	• Usually up to 5-10 years • Historic analysis first with some kind of terminal value assumption because the cash flows are not projected forever.
Project Finance model	• Different investment phases (i.e. construction, operation) • Usually no project history • Focus on cash flows and generally cover the entire defined lifetime of the project
Leverage buyout model	• Different stages: entry price, holding period and exit price • Strong focus on the way the acquisition is financed • Manner in which alternative financing sources are repaid and computation on the sponsors' return
Integrated consolidation model	• Focus on earnings per share and other ratios before and after an acquisition • Takes into account the specific financing and accounting of the transaction as well as cost savings

FINANCIAL MODEL
Valuation analysis in different architectures

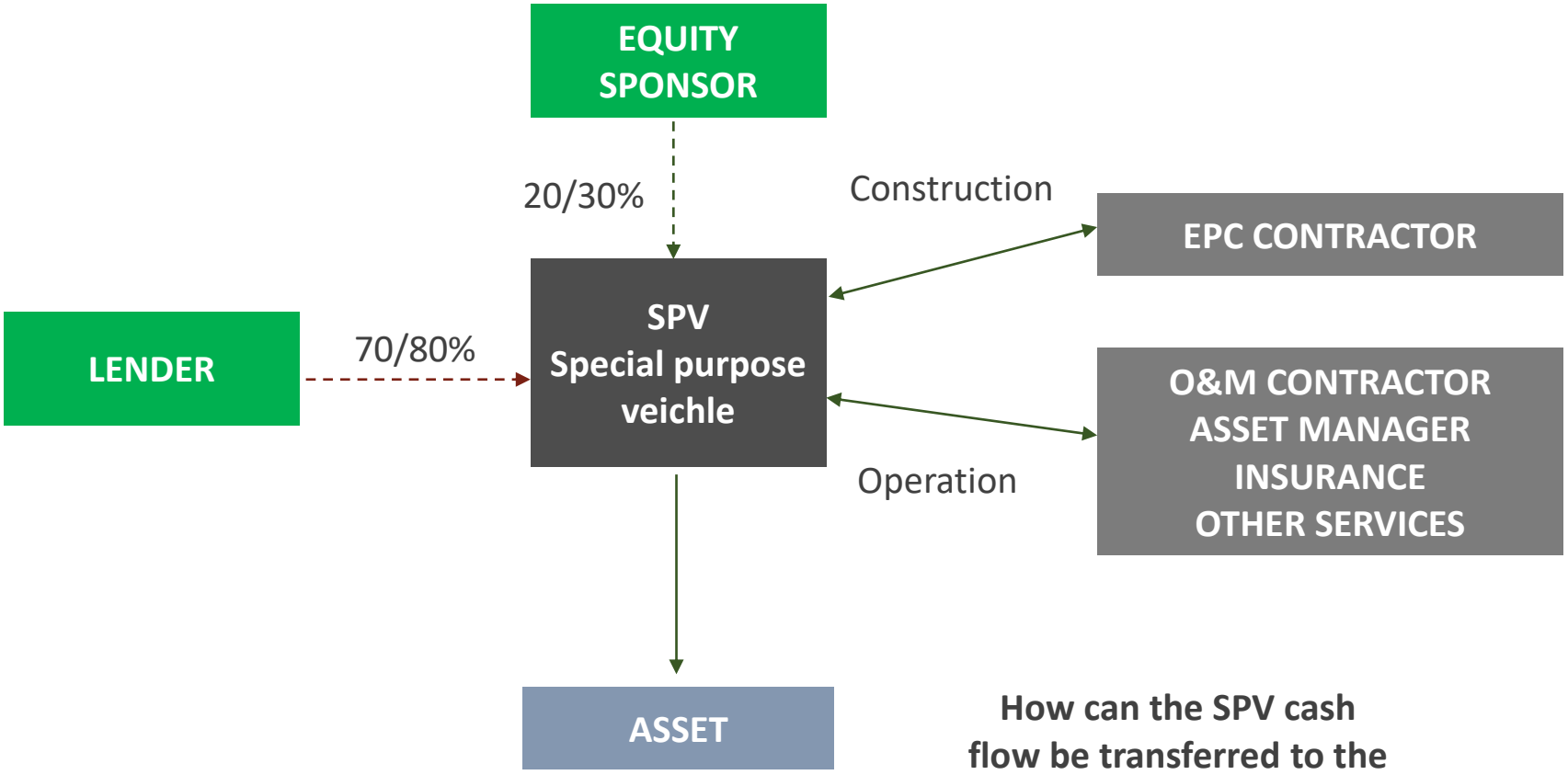
	Corporate Model	Project Finance
Model evaluation	• Present value of DCF • Multiples	• Equity IRR vs Market hurdle rate to drive investment decision and evaluation
Base Case risk measurement	• WACC • Multiples • Terminal growth	• Debt capacity • Debt terms
Risk evaluation (Equity side)	• Sensitivity analysis and scenario analysis of DCF and multiple value	• Sensitivity and scenario analysis on equity IRR
Risk evaluation (Debt side)	• Break-even analysis for refinancing and maintaining credit rating ability	• Stress test to break covenant

FINANCIAL MODEL
Structure of different architectures

	Corporate Model	Project Finance
Information Base and model starting point	• Financial statements (historical) • Market analysis • Company forecast	• Long term contracts • Framework analysis • Sources and uses
Cash flow process	• Dividends (usually driven by income)	• Cash flow waterfall
Debt analysis	• New and existing	• New debt taylored for the project
Model lifetime	• Arbitrary period	• End of project life
Model complexities	• Losses, capital structure, circularity, D&A	• Losses, cash traps, cash sweep construction period, DSRA, debt sculpting
Model output	• DCF valuation • EPS and P/E • Credit quality	• Equity IRR • Project IRR • Cover ratios

Financial structure

Typical project finance structure



How can the SPV cash flow be transferred to the equity sponsor?

VAT issues (sample case with VAT rate 20%)

Typical corporate finance structure

YEAR		1	2	3	4
Revenues		10	20	10	
Revenues cash-in (+VAT)	A	12	24	12	
Opex		(5)	(10)	(5)	
Opex cash out (+VAT)	B	(6)	(12)	(6)	
VAT yearly balance	A+B	(1)	(2)	(1)	
VAT payment	C		(1)	(2)	(1)
VAT credit/debit (end of year)	A+B +C*	(1)	(2)	(1)	-

Every year the company has a VAT debit. At the beginning of every year (usually every month), the company has to pay-back the VAT debit of the previous year

** Plus VAT credit of the previous year*

Typical project finance structure

YEAR		1	2	3	4
Capex		(100)			
Capex cash-out (+VAT)	K	(120)			
Revenues			20	10	
Revenues cash-in (+VAT)	J		24	12	
VAT yearly balance	J+K	20	(2)	(1)	
VAT payment / reimboursement	L				17
VAT credit (end of year)	J+K+L *	20	18	17	-

During the construction period (year 1), the company has a strong cash out and consequently a VAT credit. The VAT credit is partially recovered during operations. However, since the project is long-term, the company ask for a VAT refund, with a delay of 3 years
To simplify, opex are not considered

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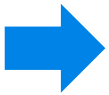

New exercise

Exercise n.1

Laibin B, China

Coal fired power plant, 2 units x 350 MW in operation since 2002, with development started in 1997

?

US$ ˜600 million project, first project in China open to international player and entirely financed by foreign players. Build-operate-transfer (BOT) mechanism.

Initial Equity Sponsors: EDF International (60%), Alstom (40%) thought a veichle – total equity arount US$ 160 M

Initial debt: commercial bank backed by Coface (French export credit agency) of around US$ 300 M, remaining US$ 140 M commercial facilities

Concession agreement to regulate the energy sale beteween the veichle and a governative body (power purchase agreement - PPA)

Please try to identify some key charactestics of the project (structure, financial structure, etc.) and to list some project risks

Exercise n.2

Starting from the previous exercise, we can consider the possibility that the debt outstanding could change. The principal repayment is always as one third of the debt outstanding.

The bank perspective is to have a project generating enough cash to cover the debt service (DSCR).
Consider that the average of these annual ratio would be higher than 1.8x:

$$\text{AVERAGE}\left(\frac{\text{unlevered cash flow}}{\text{debt service (principal repayment + interests)}}\right) > 1.8$$

Please calculate the optimal leverage ratio (D/E) to maximize the leverage IRR, respecting the previous condition