PROJECT FINANCING

PROJECT FINANCING- TCH 426E
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Consulting and Training

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Consulting

- **BRED**: bank accounting, **BNP IP**: Solvency 2, **BNPP**: cash management, **CNP**: front to accounting system, **SOCIETE GENERALE SGCIB** Product Control Group, **CNCE**: ALM project, **NATIXIS SDR**: P&L control, **VINCI** Treasury: Financial Reporting **CACIB:** Derivatives and Credit Structured products, **XRT / SAGE**, Treasury Software, **ABN AMRO**: VAR validation group, Amsterdam

Banks

- **Credit Lyonnais London**, head of Middle Office, **Credit Lyonnais Paris**, P&L and Risks, "**Chambre Syndicale des Banques Populaires"**: Operational Research Group

Professional Training

- Professional Training: First Finance, Top Finance, Investance, Spring Finance, Sciences Po Paris: CE.com program for Central Bank
- Masters in Finance: Inseec, Cergy, Dijon, Grenoble
- Foreign: Alger, Tunis, Casablanca, Lisboa, Luxembourg
- Vietnam: PVComBank, BIDV, Sea Bank

Course Description

This course equips students the fundamental knowledge associated with project financing, including:

- What is project financing
- Risk analysis
- Risk management in project financing,
- The role of project advisors in the project financing activity
- Project evaluation and cash flow analysis
- Credit risk in project financing transaction and the Basel Accords.

Planning

Knowledge

Understand the fundamental knowledge of project financing

Understand and analyze risk and manage risk of projects

Understand project evaluation methods

Understand knowledges associated with project financing

Skills

Project risk analyzing skills

Project risk management skills

Project evaluation skills

Project financing skills

Planning

- Overview of Project Finance
- Contractual Framework and Documentation
- Cost of capital
- Project Evaluation – key indicators
- Cash Flow Simulation
- Project Modeling
- Project Risks
- Risk analysis and Simulations
- Case study
- Project Finance in the economy

Skills

- Engineering
- Project Management

- Fiscal
- Legal
- Economic Calculation
- Finance
- Accounting
- Modeling

Project Financing

Project financing may be defined as the **raising of funds** on a limited-recourse or nonrecourse basis to finance an economically separable **capital investment project** in which the providers of the funds look primarily to the cash flow from the project as the source of funds to service their loans and provide the return of and a return on their equity invested in the project.

The terms of the debt and equity securities are tailored to the cash flow characteristics of the project

Capital Budgeting

Capital budgeting (or investment appraisal) is the planning process used to determine whether a firm's long term investments such as new machinery, replacement machinery, new plants, new products, and research development projects are worth pursuing.

The real value of capital budgeting is to rank projects. Most organizations have many projects that could potentially be financially rewarding

How to invest in the **most profitable** projects, that will add the biggest value to the firm ?

How to evaluate , compare or select among independent or dependant projects ?

Importance of Capital budgeting : decisions are long term in nature,

substantial capital outlays and difficult to reverse without high cost

Projects Types

ENERGY

- Pipelines,
- Refineries,
- Electric power generating facilities,
- Natural Gas Liquefaction, Coal Gasification Plants
- Hydroelectric projects (dam),
- Mineral processing facilities,
- Cogeneration Projects (steam),

PUBLIC INFRASTRUCTURES

- Dock facilities,
- Toll roads

- Manufacturing Facilities

Definition

Project Finance involves one or more corporate SPONSORS investing in and owning a single purpose, industrial asset through a legally independent project company financed with limited or non recourse debt.

One industrial PROJECT

One Single Purpose Company: SPV or Special Purpose Vehicle.

One or more corporate SPONSORS

Actors

Financial Side:

- Sponsor = Investors
- Lenders = Banks, Syndicate, International Institutions

Operations:

- Operators = Operational Project Side

Contracts with Firms/States (Public/Private)

- Suppliers
- Purchasers

Investors

A syndicate of banks may enter into a financial agreement to finance the project company.
There may be several classes of lending banks:

- international banks lending foreign currency,
- local banks lending domestic currency for local costs,
- export credit agencies lending or guaranteeing credits to finance suppliers to the project of their national equipment,
- international agencies lending or guaranteeing development credits (World Bank, Asian Development Bank, African Development Bank, European Bank for Reconstruction and Development).

Contracts

The project company enters into various contracts necessary to construct and operate the project

The major types of contracts include:

- EPC contract: engineering, procurement and construction, to build

and construct the project facility,

- O&M contract: operation and management, to manage and operate the facility and project during its operational phase,
- Supply contract: the project company enters into contracts with suppliers to ensure an uninterrupted supply of raw materials necessary for the project,
- Off-take agreements: the project company enters into contracts

with purchasers of the project company's product or service.

Special Purpose Vehicle:

Economically and legally independent project company

One legal structure with own accounting rules from one country

- own investors (equity side)
- own debt (syndicate of banks or international institutions)
- suppliers and clients via legally biding contracts (offtake contracts)
- assets belonging to project
- own governance

No links to balance sheet of Sponsors.

Real difference from Corporate Finance

Project Financing

Project

Finite Project Life: set up contracts with maturity dates

Clear identification of external needs based on contracts.

Manage the closure (or re-sale) of project/assets

Financing

Active and Passive

Pure Financial or Equity

Linked to risks

Key Framework

How to separate Operational from Financial?

Example:

A project operational return is 15%

The cost of funds from banks is 2%

The Debt Ratio is 75%

Calculate the ROE for an investment of 100 million USD

Key Framework

Calculate the ROE for an investment of 100 million USD

Per year:

Profit: 100 M x 15% = 15 M USD

Debt: 75M

Equity: 25M

Cost of Debt: 75M x 2% = 1,5M

Net Profit: 15 – 1,5 = 13,5 M

Return on Equity: 13,5 / 75 = 54%

DEBT RATIO = 75 / 100 = 75 %

D/E RATIO = 75 / 25 = 3

Key Framework

Equity Side: 25 M x 54% = 13,5 M

Bank Side: 75 M x 2% = 1,5 M

Operations: 100 M x 15% = 15 M

$$15\% = 25\%.54\% + 75\%.2\%$$

$$ROE = 4.ROP - 3.RBk = 4.15\% - 3.2\% = 60 - 6 = 54$$

$$\mathrm{ROE} = \frac{\mathrm{ROP}}{\mathrm{r}} - \frac{(1-\mathrm{r}).\mathrm{Rbk}}{\mathrm{r}}$$

Benefits

- Non-recourse/limited recourse
- Leveraged debt
- Favorable tax treatment
- Favorable financing terms
- Political risk diversification
- Risk sharing
- Collateral limited to project assets
- Limited flexibility to management: cash flow waterfall
- Lenders are more likely to participate in a workout than foreclose
- Long term contracts instead of market access

Disadvantages

- Complexity of risk allocation
- Increased lender risk
- Higher interest rates and fees due to non-recourse
- Lender supervision
- Lender reporting requirements and higher disclosure
- Increased insurance coverage
- Higher transaction costs due to higher complexity
- Conflicts between Sponsors and Management

Ratios

$$DEBT\_RATIO = \frac{TOTAL\ DEBT}{TOTAL\ ASSETS}$$

$$DEBT\_TO\_EQUITY\_RATIO = \frac{TOTAL\ DEBT}{TOTAL\ EQUITY}$$

$$\text{TOTAL DEBT} + TOTAL\ EQUITY = TOTAL\ ASSETS$$

Key Takeaways

Project Finance 1

Legal Entity: SPV – Special Purpose Vehicle

Limited in Time : Preparation, Construction, Operation, Termination

Limited in Scope : Assets and Cash Flows

Credit: based on Cash Flows not on Credit Rating

Sponsors	**Equity**	**Financials**	**ROE**	**Dividend**
Investors	**Debt**	**Operations**	**ROA**	**Interest**

Risk mitigation / hedging / coverage :

with Long Term Contracts with Suppliers and Clients

also with operators regarding obligations : use of ratios

Exercice

How to separate Operational from Financial?

Example:

A project operational return is 10%

The cost of funds from banks is 6%

The Debt Ratio is 80%

Calculate the ROE for an investment of 20 million USD

Exercice Correction

Calculate the ROE for an investment of 20 million USD

Per year:

Profit: 20 M x 10% = 2 M USD

Debt: 16M

Equity: 4M

Cost of Debt: 16M x 6% = 0,96M

Net Profit: 2 – 0,96 = 1,04 M

Return on Equity: 1,04 / 4 = 26%

DEBT RATIO = 16 / 20 = 80 %

D/E RATIO = 16 / 4 = 4

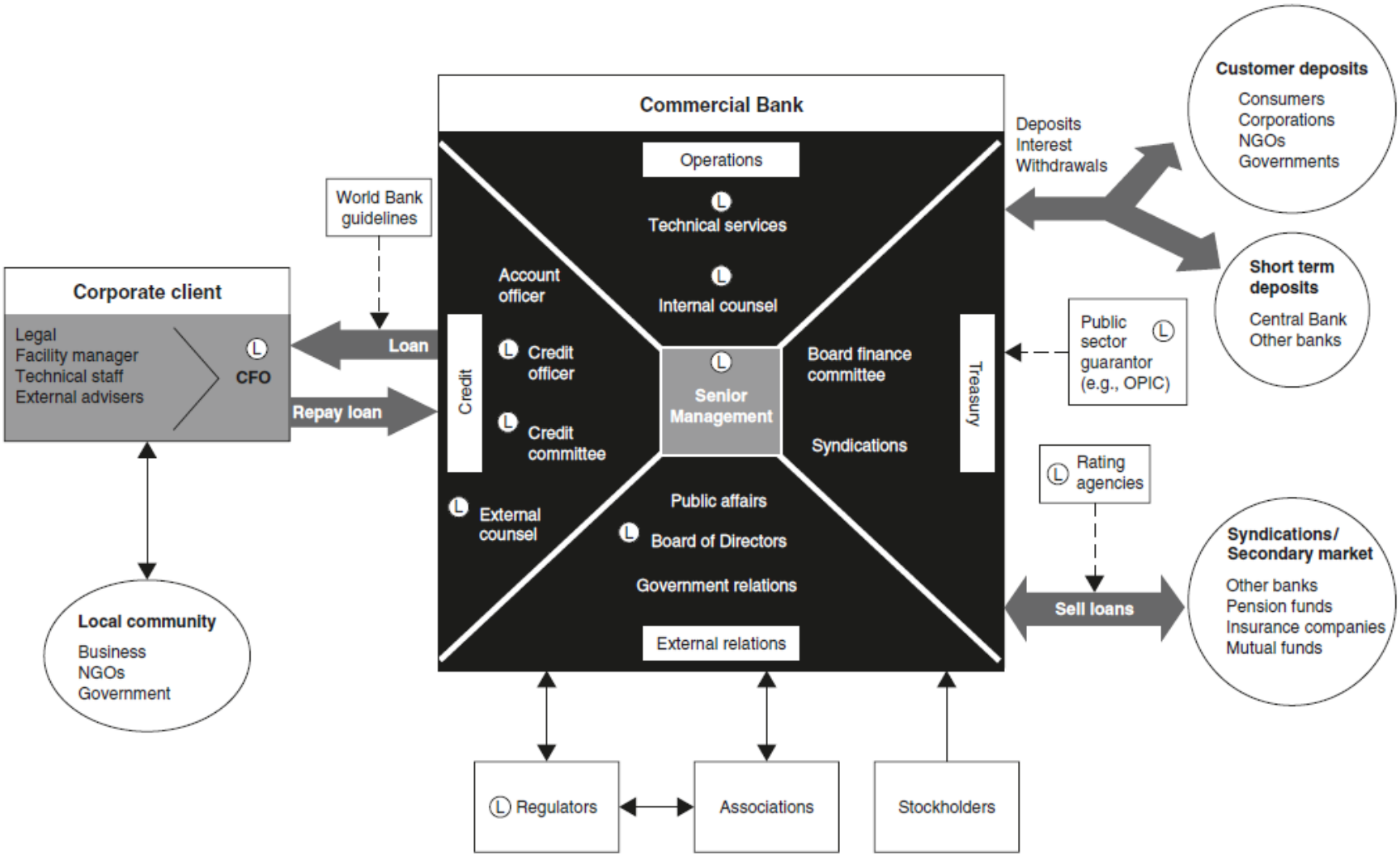
ROA ROE in Banks

	French EUR	Vietnam VND	Vietnam USD	
	billion	billion	billion	
ASSETS	7576	12927000	517,08	(1)
REVENUE	147			(2)
PROFIT	25			(3)
EQUITY	400	1100000	44	(4)

MARGIN	1,94%			(1)/(2)
ROA	0,33%		0,51%	(1)/(3)
DEBT RATIO	94,72%			(1)/(4)
ROE	6,25%		6,27%	(3)/(4)

Source VN : https://www.sbv.gov.vn/webcenter/portal/en/home/sbv/statistic

Project Mapping



2 – Accounting

Accounting

Question:

What are the roles of accounting?

_____

Accounting

Question:

What are the roles of accounting?

Answer:

- Pay taxes, via P&L calculation
- Managing : assets/liabilities, inventories, revenues and costs
- Communicate with shareholders about financial situation

Two main attitudes:

1 - ACCOUNTING – TAX LAWS AND RULES

to pay taxes and there is arbitrage

2 - ECONOMIC – ECONOMIC LAWS

to take decision and there is no arbitrage

Accounting

What are the components of an accounting reporting?

Accounting

Question:

What are the components of an accounting reporting?

Answer:

1 – Balance Sheet	assets and liabilities – stock at a date
2 – Income Statement	cost revenues – flows of the year
3 – Cash Flow Statement	past and future flows

https://corporatefinanceinstitute.com/resources/knowledge/accounting/3-financial-statements-linked/

REPORTS

CASH FLOW STATEMENT

INITIAL BALANCE

REVENUE
COST OPEX
TAX
WORKING CAPITAL
CONSTRUCTION

EQUITY
DEBT
LONG TERM INT
SHORT TERM INT
CORPO TAX

_____

FINAL BALANCE

POSITIVE BALANCE
NEGATIVE BALANCE

INCOME STATEMENT

REVENUE
COST OPEX
SALARY
TAX

AMORTIZATION
DEPRECIATION
INTEREST

CORPO TAX
DIVIDEND

_____

EARNINGS

CUMULATED EARNINGS
= RETAINED EARNINGS

BALANCE SHEET

ASSETS
FIXED ASSETS
POSITIVE BALANCE
NEGATIVE WORK CAP

_____

TOTAL ASSETS

LIABILITIES
EQUITY
DEBT
RETAINED EARNINGS
DSRA
NEGATIVE BALANCE
POSITIVE WORK CAP

_____

TOTAL LIABILITIES
CONTROLS: TOTAL ASSETS = TOTAL LIABILITIES

Accounting

The **old view** of accounting

look mainly on past events and register them

The **modern view** of accounting

look on past and future events

for future events do 2 things: evaluation (pricing) and reserves

RESERVES are based on the Mean values (expected value)

With modern accounting appeared Risk Management (Basel Agreements)

Cover Measured Risks with capital

Risk is measured with “standard deviation”

Accounting

The modern view of accounting

RESERVES are used to take into account future events.

RESERVES are based on Mean Values (Expected Value)

With modern accounting appeared Risk Management (Basel Agreements)

How to cover Risks

1 – how to measure Risk

2 – how to cover risk

Risk is based on “Standard deviation”

Hedging is done with Capital: Solvency Ratio

Accounting

EBITDA = Earnings Before Interest, Taxes, Depreciation, Amortization

= Revenues

- Operational Costs: material and services

- Labor Costs

EBIT = Earnings Before Interest and Taxes

= EBITDA

- Depreciation

- Amortization

Net Income =

+ EBIT

- Interests

- Taxes

3 – Excel Simulations

Table with single entry

- This functionality permit to replicate a calculation on different inputs.
- The calculation is a series of steps between one single cell (the input) and one or many cells (the output)
- The simulation change the input cell with respect to a list and returns the output cells accordingly

INPUT CELL		=B2^2	=ACOS(B2/500)	=LOG(B2)	=1/B2
2		4	1,56679632	0,301030	0,500000
	2	4	1,56679632	0,301030	0,500000
	8	64	1,55479564	0,903090	0,125000
	14	196	1,54279267	1,146128	0,071429
	20	400	1,53078565	1,301030	0,050000
	26	676	1,51877286	1,414973	0,038462
	32	1024	1,50675256	1,505150	0,031250
	38	1444	1,49472297	1,579784	0,026316
	44	1936	1,48268235	1,643453	0,022727
	50	2500	1,47062891	1,698970	0,020000
	56	3136	1,45856084	1,748188	0,017857
	62	3844	1,44647634	1,792392	0,01612903
		=TABLE(,B2)	=TABLE(,B2)	=TABLE(,B2)	=TABLE(,B2)

Table with double entries

- This functionality permit to replicate a calculation on different inputs.
- The calculation is a series of steps between two cells (the inputs) and one cell (the output)
- The simulation change the input cells with respect to a list in column and in lines and returns the output cell accordingly

INPUT CELLS	=B2+B3*B3				
3	7	3	5	7	15
2	2	7	9	11	19
	8	67	69	71	79
	14	199	201	203	211
	20	403	405	407	415
	26	679	681	683	691
	32	1027	1029	1031	1039
	38	1447	1449	1451	1459
	44	1939	1941	1943	1951
	50	2503	2505	2507	2515
	56	3139	3141	3143	3151
	62	3847	3849	3851	3859
		=TABLE(B2,B3)	=TABLE(B2,B3)	=TABLE(B2,B3)	=TABLE(B2,B3)

Table with multiple entries

With the previous functions, find a way to increase the number of input parameters.

In order to run simulations with:

- P input = parameters
- N output = ratios…

Table with multiple entries

1 - Create the scenarii table
Select the input parameters in column: P parameters
The first column is the scenario number: S scenarii
Give this table a name: “TSC” : size: (S) x (P+1)

2 – Select a cell to be the INPUT cell: give it a name: CSC

3 – Modify the selected inputs with the **INDEX** function, with table TSC, column number the scenario CSC, line number the input parameter number

4 – Define the output table on the right of the scenari table with first column the scenario number, the top line, the N selected outputs.

5 – Use the Single Entry Table to fill in the output table (S+1 x N+1), with CSC as the input line cell.

Key Takeaways

Project Finance 2

Accounting Reports

Cash Flow Statement	Flows	link with neg/pos Balance
Income Statement	Flows	link with retained Earning
Balance Sheet	Stock	

Accounting	**Reserves**	**Mean Loss**	**ISDA**
Risk	**Capital**	**Standard Deviation**	**BASEL**

Excel: Single and Double entry TABLE
Multiple entry TABLE with Scenarii Table

4 – Funding

Project's financing strategy

- Equity sources: Project's sponsors, equipment suppliers, local authorities, private investors, infrastructure funds…
- Equity features: Common equity, Preferred equity, Warrants

- Debt sources: Bank debt, public and private bond markets.
- Debt features: Senior debt, subordinated debt, fixed / floating rate, security package…

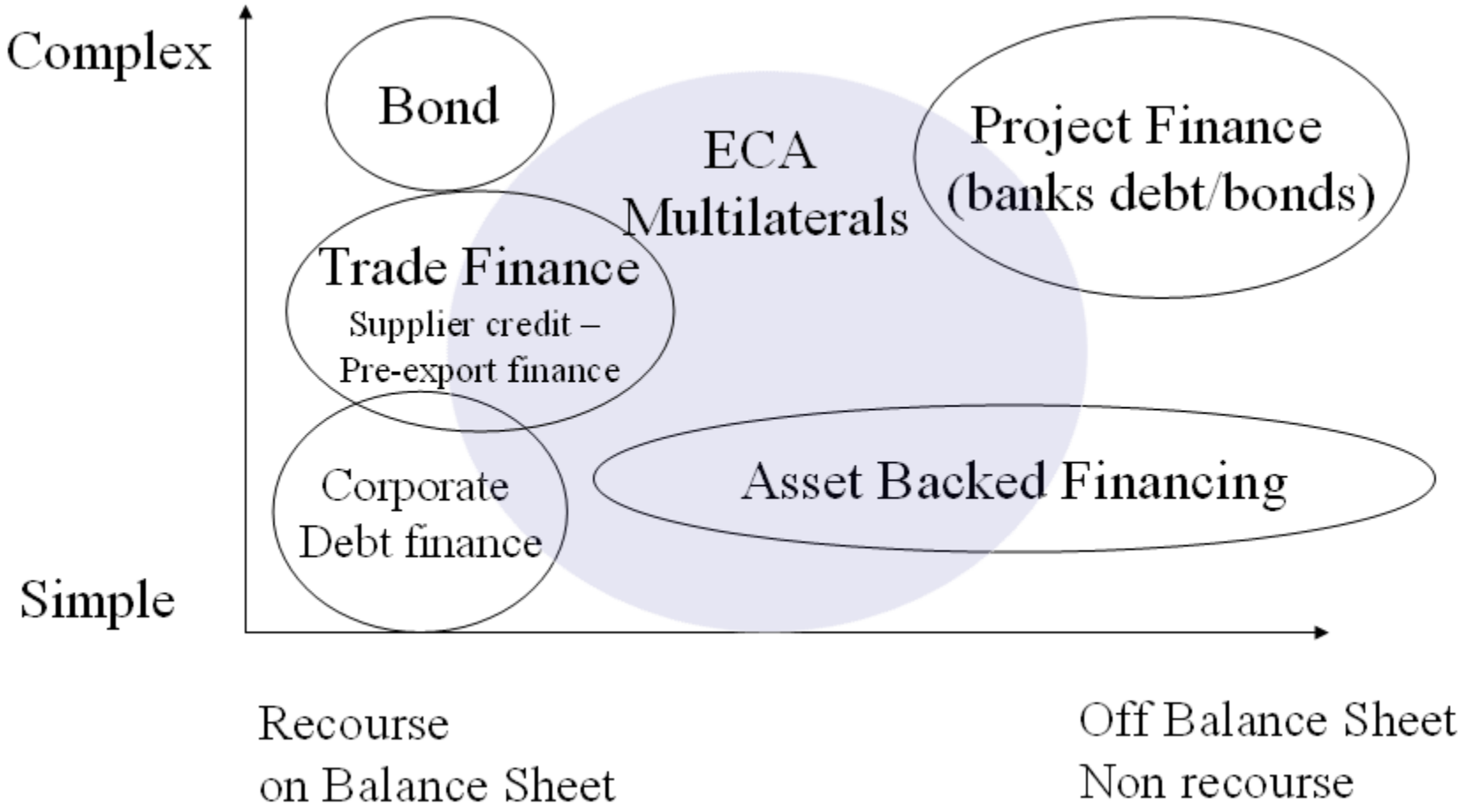
Funding

Adequacy of **Debt** to fund the Project will depend on complexity, underlying risk, underlying asset to finance, eligibility, market conditions …

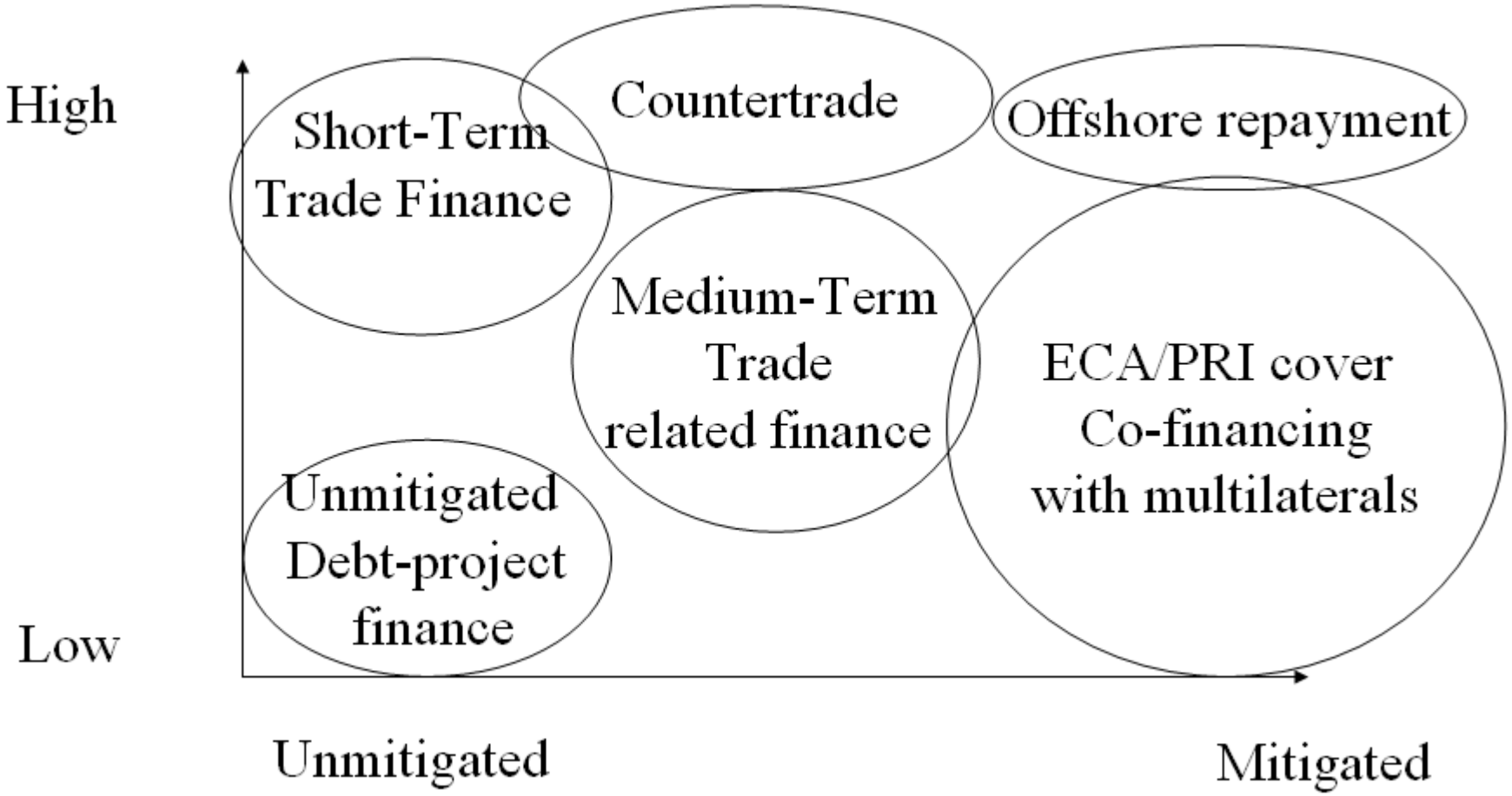
Debt will be sourced from a variety of providers:

- Buyer Credit
- Supplier Credit
- Long and short term Asset Backed Lending = Leasing
- Conventional Trade Finance
- Conventional Senior Debt
- Bond Issues
- ECA : Export Credit Agencies e.g. ECGD, COFACE, HERMES, Eximbank, SACE
- Non commercial finance: e.g. development loans from regional national or international development agencies and Multilateral Agencies (EIB, BERD, Asian Development Bank)

Project's financing strategy



Project's financing strategy Country Risk



Project's financing strategy

Assessing the Project components' eligibility to debt funding alternatives (example):

Uses of funds	**Possible Sources of funds**
Imported equipment/services	ECA Buyer credit, Supplier credit, Leasing
Local infrastructure work	Equity, Finance credit, Bond
Insurance premia	Buyer credit, Supplier credit
Capitalized interest	Equity, commercial loan
Start-up operating losses	Equity, commercial loan
Working capital requirements	Equity, commercial loan

Project's financing strategy

- Bankability : "the ability to raise adequate funding from lenders on acceptable terms to enable a project to be financed on a limited recourse basis"

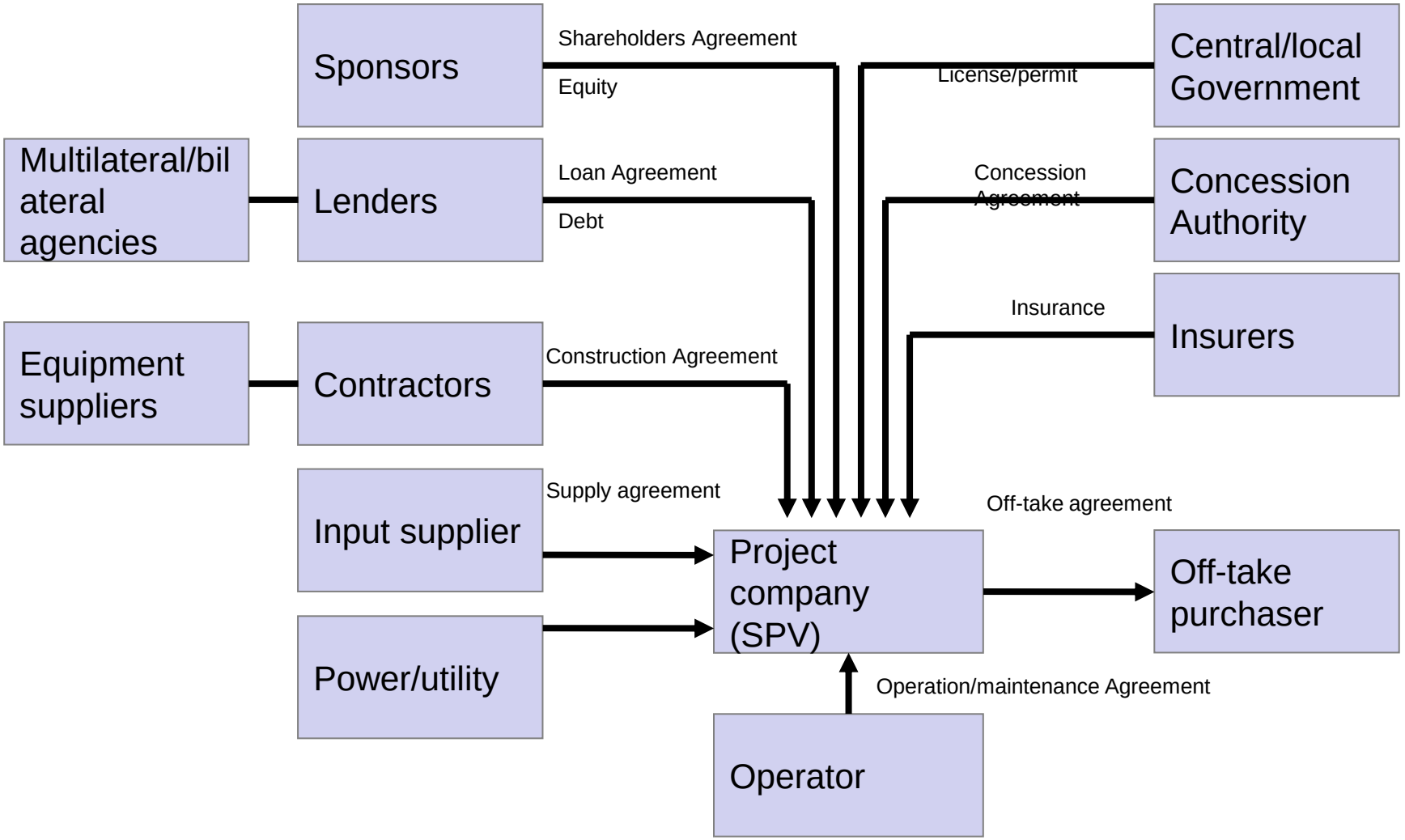
- Fundamental Bankability questions :
  - Will lenders be prepared to lend to a Project?
  - How much will they lend?
  - What will be the average rate: WACC?

- IF NOT SPONSORS WILL HAVE TO FINANCE IT ON THEIR BALANCE SHEET USING THEIR OWN CAPITAL OR ON RECOURSE DEBT

The Project Finance Process

- Assessment of Project's risks.
- Mitigation of Project's risks.
- Allocation of Project's risks among participants.
- Understanding and mastering the Project Financing process is a prerequisite to success.
- Adequate process aims at achieving three main goals:
  - Project completion on time
  - Project completion within budget
  - Project completion meeting all specifications set by stakeholders.

Typical Structure of Conventional PF



5 – Financial Calculus

Investment decision Criterias

Many formal methods are used in capital budgeting:

- NPV - Net Present Value
- IRR - Internal Return of Rate
- PI - Profitability Index
- Pay back period
- Discounted Pay back period

Other ratios are based on accounting ratio (see later)

Interest Rate

Definition of an interest rate
Definition of the value of time via

- Discount Factor
- Capitalization Factor

Presentation of two most important performance methods:

- NPV – Net Present Value
- IRR – Interest Rate of Return

How purpose is the find criteria to take decision about the financing of a project.

Interest Rate

What is the unit of an interest rate?

% Percentage ?

1 basis point = 1 bp = 0.01% = 0.0001 ?

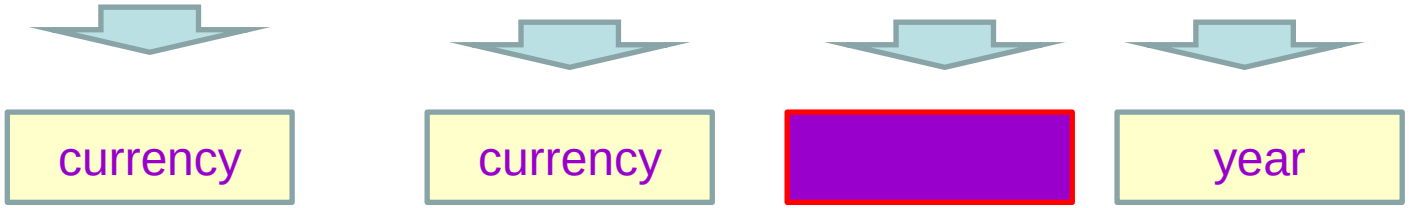
Simple Interest

Simple interest is based on 3 parameters:

- nominal
- interest rate
- duration

The units are inferred from the units :

INTEREST = NOMINAL * RATE * DURATION



Example: 4 000 000$ at 5% on 3 months, gives 4M. ,05 / 4 = 50 000$

Simple Interest

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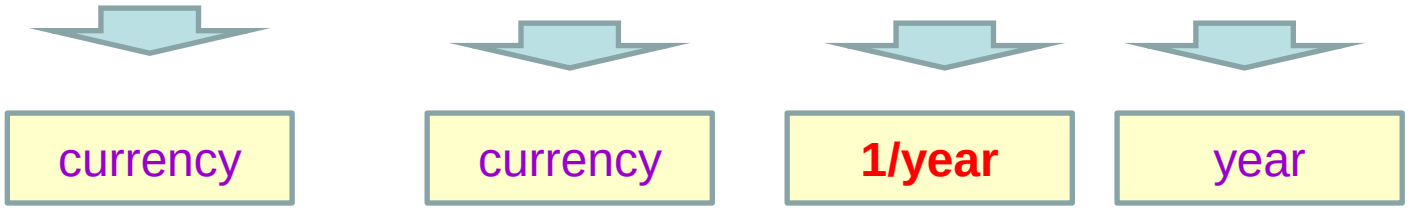


Example: 4 000 000$ at 5% on 3 months, gives 4M. ,05 / 4 = 50 000$

Discount Factor and Capitalization Factor

Discount factor DF

With: rate: r and duration: t

if t less than 1 year

$$DF = \frac{1}{(1 + r.t)}$$

if t is greater than 1 year

$$DF = \frac{1}{(1 + r)^t}$$

The capitalization factor CF is the inverse of DF: CF = 1/DF

$$CF = 1 + r.t \qquad CF = (1 + r)^t$$

DF is always lower than 1 (except when rates are negative!)

Ex: 10% with 6 months: DF=1/(1+10%.0.5) = 0.9523 CF=1,05

Net Present Value

DF (Discount Factor) is the price of a future cash flow

VALUATION FORMULA:

The valuation (NPV – Net Present Value) of a cash flow series from a Project is equal to the sum of the discounted value cash flows:

$$NPV = \sum_{i=1}^{n} \frac{CashFlow_i}{(1+r_i.t_i)}$$

Remarks: NPV depends on an Initial Date

Net Future Future Value

CF (capitalization factor) is the price of a cash flow at a future date

VALUATION FORMULA:

$$FV = \sum_{i=1}^{n} CashFlow_i . (1 + r_i . t_i)$$

Remarks: FV depends on a Future Date

Financial Calculus in Excel

1 Future Value
constant cash flows FV(1000;4,10%)=4641

2 Discounted Value
constant cash flows PV(150;6;4%)=-786,32
Present date is date 0
Negative value

3 Discounted Value NPV(1000:-500:-1500:3000;3%)=1792,32
different cash flows
Present date is date 0

4 Discounted Value with Dates XNPV(150:200:200:250:400;5%)=1184,03

5 Capitalization with different rates FXSCHEDULE(2000;5%:4%:3%:5%:4%)=
2456,48

6 Internal Rate Return IRR(-12000:200:300:-100:12200)=1,2552%

7 Internal Rate Return with dates XIRR(-12000:200:300:-100:12200
1/2/20:1/3/20:1/4/20:1/5/20:1/6/20)=16,2472%

IRR: Interest Rate Return

The purpose of this method is to calculate an interest rate.

We first forecast all Future Cash Flows.
Then, we solve this equation to get IRR

$$\sum_{k=0}^{T} \frac{Cash\ Flows_k}{(1+irr)^{t_k}} = 0$$

The list of Cash Flows must contain opposite signs
There can be many solutions
The IRR does not depend on a date.

Internal Rate of Return – Project IRR

IRR is useful when investors assess the project against their **hurdle rate**, which is a **cost of capital.**

- **IRR > Hurdle Rate**: the project will produce more cash than the necessary amount to repay debt and deliver dividend to shareholders.
- **IRR = Hurdle Rate**: the project will produce the exact amount of cash to compromise investors' cost of capital.

Weak points of IRR

- It applies the project's IRR to the reinvestment of cash in flows
- When there are more than one change from cash out-flow to cash-in flow, or from cash-in flow to cash out-flow in the projection, the value of IRR are multiple.

IRR: Interest Rate Return

Simplified method without dates: Excel Function IRR

IRR(flows, estimated rate)

We must enter cash flows with equal period between each flows.
The period is either in months or years.
The rate is then based on this period – a conversion is required when the period is not the year in order to get a correct annual rate.

The second argument is optional – it is there to improve the convergence of the resolution of this equation.

IRR – Internal Rate Return

Method with dates: Excel Function XIRR

XIRR(flows, dates, estimated rate)

$$\sum_{k=0}^{n} \frac{flux_k}{(1+taux)^{(T-tk)/365}} = 0$$

This method uses dates attached to each cash flows.
Then, we must set up a reference period, that has been chosen here as the day.
But the IRR rate is still an annualized rate.

Exercice IRR

With these Cash Flows, calculate IRR with both methods.

FLOWS	
01-feb-20	-12 000,00
01-mar-20	200,00
01-apr-20	300,00
01-mai-20	-100,00
01-jun-20	12 200,00

Exercise - IRR

Periods Months and Days here:

period month	function IRR	1,2552%
	Annualisation – proportional	15,0628%
	Annualisation – actuarial	16,1474%
period days	function XIRR	16,2472%

$$-12000+\frac{200}{(1+1{,}26\%)^{1}}+\frac{300}{(1+1{,}26\%)^{2}}-\frac{100}{(1+1{,}26\%)^{3}}+\frac{12200}{(1+1{,}26\%)^{4}}=0$$

$$-12000.(1+1{,}26\%)^{4}+200.(1+1{,}26\%)^{3}+300.(1+1{,}26\%)^{2}-100.(1+1{,}26\%)^{1}+12200=0$$

$$((((12000.(1+1{,}26\%)-200)(1+1{,}26\%)-300)(1+1{,}26\%)+100)(1+1{,}26\%)=12200$$

$$12.1{,}26\%=15{,}0628\% \qquad 1{,}012552^{12}=1{,}161474$$

Exercice - IRR

Control with monthly periods

Dates	Flows	Duration	DF
01-feb-20	-12 000,00	0	1,0000
01-mar-20	200,00	1	0,9876
01-apr-20	300,00	2	0,9754
01-mai-20	-100,00	3	0,9633
01-jun-20	12 200,00	4	0,9513
			0,0000

Control with daily periods

Dates	Flows	Duration	DF
01-feb-20	-12 000,00	0	1,0000
01-mar-20	200,00	-0,0658	1,0100
01-apr-20	300,00	0,1644	0,9754
01-mai-20	-100,00	0,2466	0,9633
01-jun-20	12 200,00	0,3315	0,9510
			0,0000

Cash Flow Forecast

Financial Cash Flow of the project must be forecasted for the various periods:

Investment phase: negative flows during the building period

Production phase: positive cash flows from the operations

Termination phase: depends on how to estimate the closure of the project

This implies to define a Maturity Date.

Infinite maturity date is not something unusual for calculations

Cash Flow Forecast

Investment phase: negative flows during the building period. Capital expenditure: easy to define as usually defined by investors: shareholders and financing parties such as banks.

Production phase: positive cash flows from the operations

More difficult to estimate and usually based on production capacities and selling prices defined in long term contracts.

Termination phase: estimation of the remaining values of the project

Cash Flow Forecast

Cash In:

- Increase in Equity
- Increase in Debt
- Sale of Assets
- Revenues
- Decrease of Working Capital

Cash Out:

- Redemption of Equity
- Debt Repayment
- Debt Interest
- Purchase of Assets
- Costs
- Dividends
- Taxes
- Increase of Working Capital

Cash Flow Forecast

1. Estimate the expected future cash flows from the project. This is like estimating the coupon payments for a bond or the dividend stream for a stock, and a maturity value or terminal sale price.

2. Assess the risk and determine a required rate of return (cost of capital) for discounting the expected future cash flows.

3. Compute the present value of the expected future cash flows.

4. Determine the cost of the project and compare it to what the project is worth. If the project is worth more than it costs—if it has a positive

NPV—it is worth undertaking.

Net Present Value – Discounted Rate

NPV is the Present Value of Future Cash Flows associated with the project

$$\text{NPV} = -\sum_{k=1}^{N} \frac{Investment\ CF}{(1+r)^k} + \sum_{k=1}^{N} \frac{Production\ CF}{(1+r)^k} + \sum_{k=1}^{N} \frac{Termination\ CF}{(1+r)^k}$$

With

The discounting rate r is constant.

It is a common practice to define it as the **cost of capital or hurdle rate**

Higher discount rate may be more appropriate when project risk is higher than the risk of the firm to take into account a risk premium.

Project NPV

The NPV is greatly affected by the **discount rate**, so selecting the proper rate - sometimes called the **hurdle rate** - is critical to making the right decision.

The hurdle rate is the minimum acceptable return on an investment.

- Positive NPV: the project will generate more cash than the necessary amount to repay debt to banks and deliver dividend to shareholders, the excess cash solely to the project's shareholders.
- Zero NPV: the project will generate exactly the necessarily amount of cash to repay debt to the banks and deliver dividend to shareholders.
- Negative NPV: the project cannot generate cash to repay debt to banks and deliver dividend to shareholders.

Project NPV – Pros and Cons

Weak points of NPV:

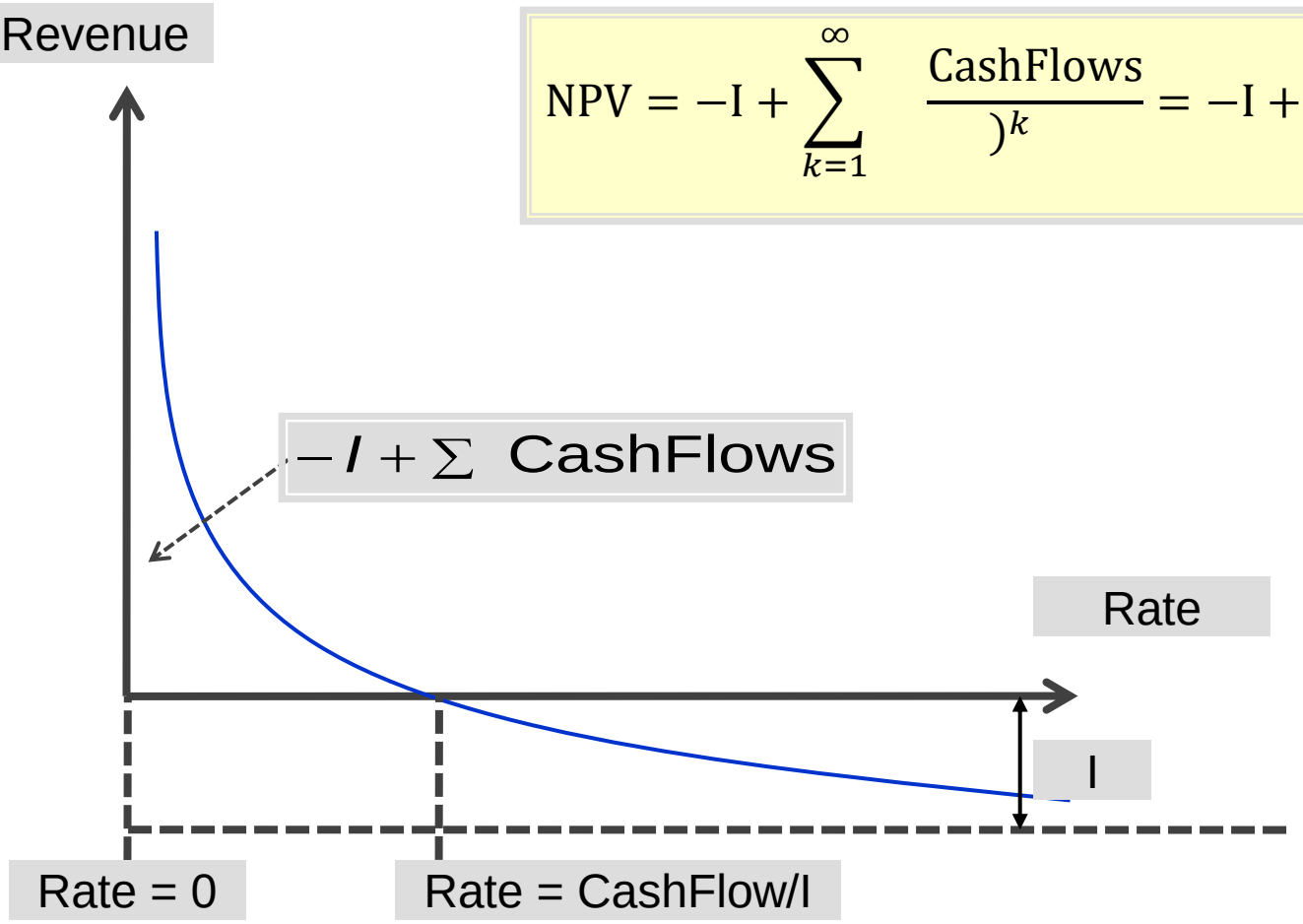
Use of a single discount rate, but may use different rates depending on the future dates.

Do not depend on the scale of the project.

Problems to choose the discount rate: solution is to simulate the project NPV with different rates

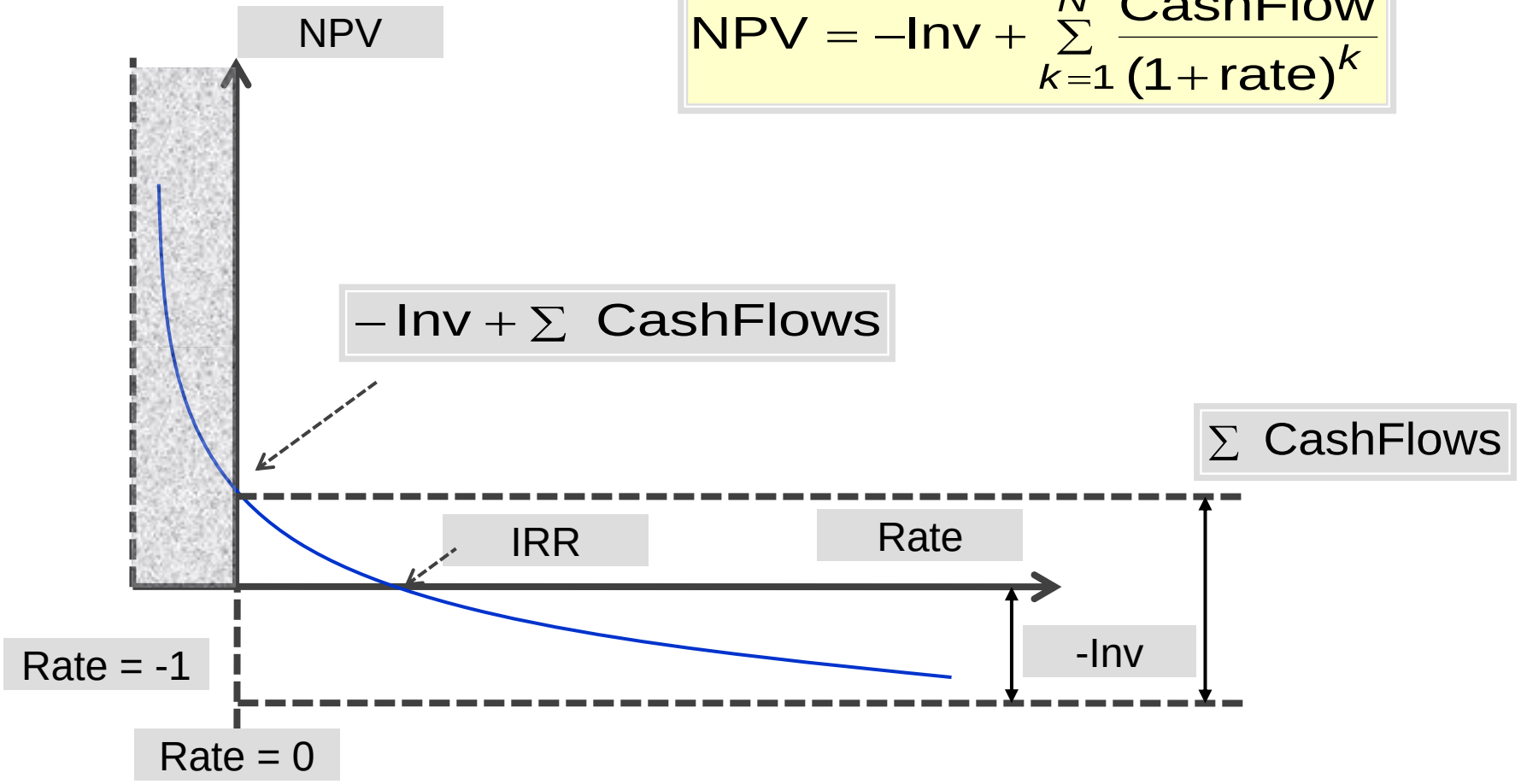
Criteria - NPV

$$NPV = -I + \sum_{k=1}^{\infty} \frac{CashFlows}{)^k} = -I + \frac{CashFlows}{rate}$$

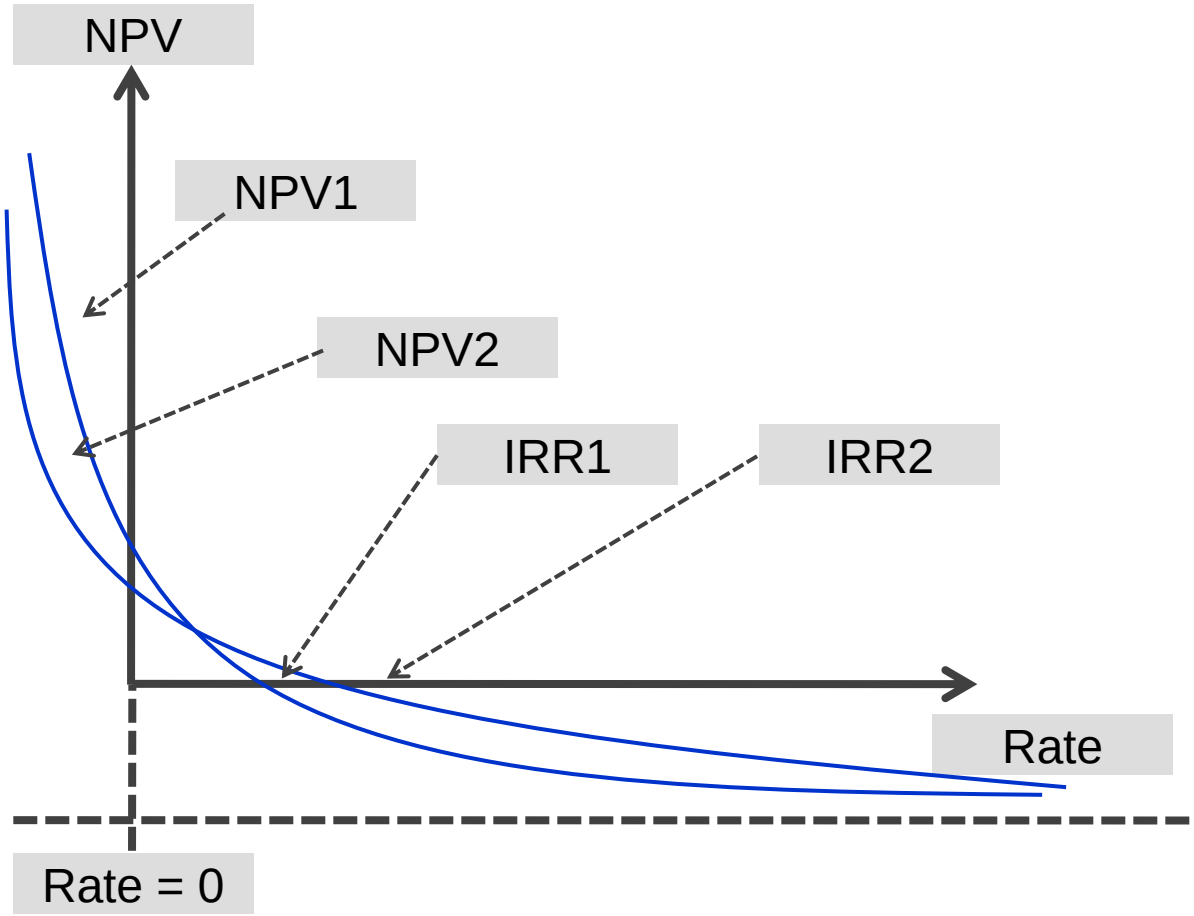


NPV Profile

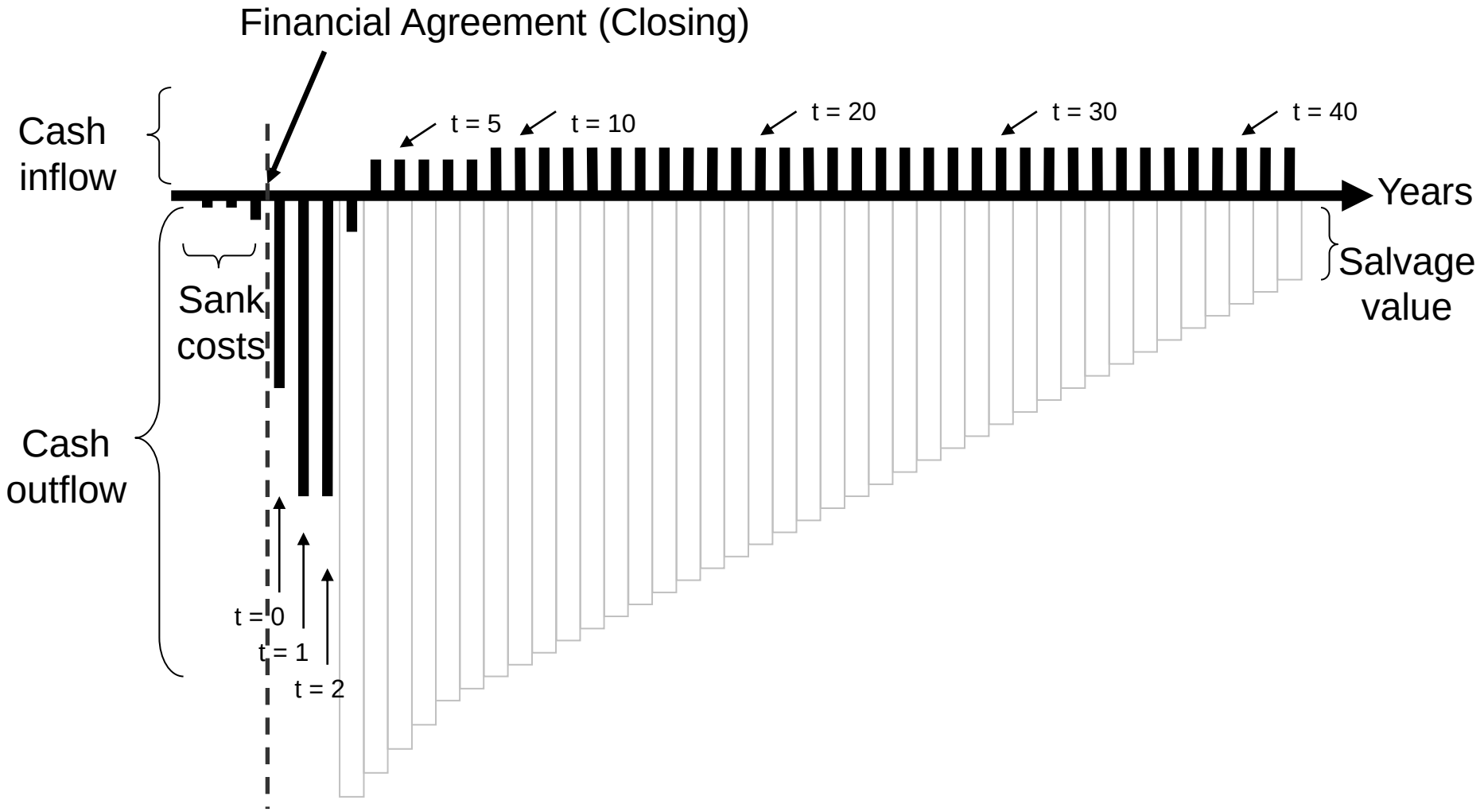
$$NPV = -Inv + \sum_{k=1}^{N} \frac{CashFlow}{(1+rate)^k}$$



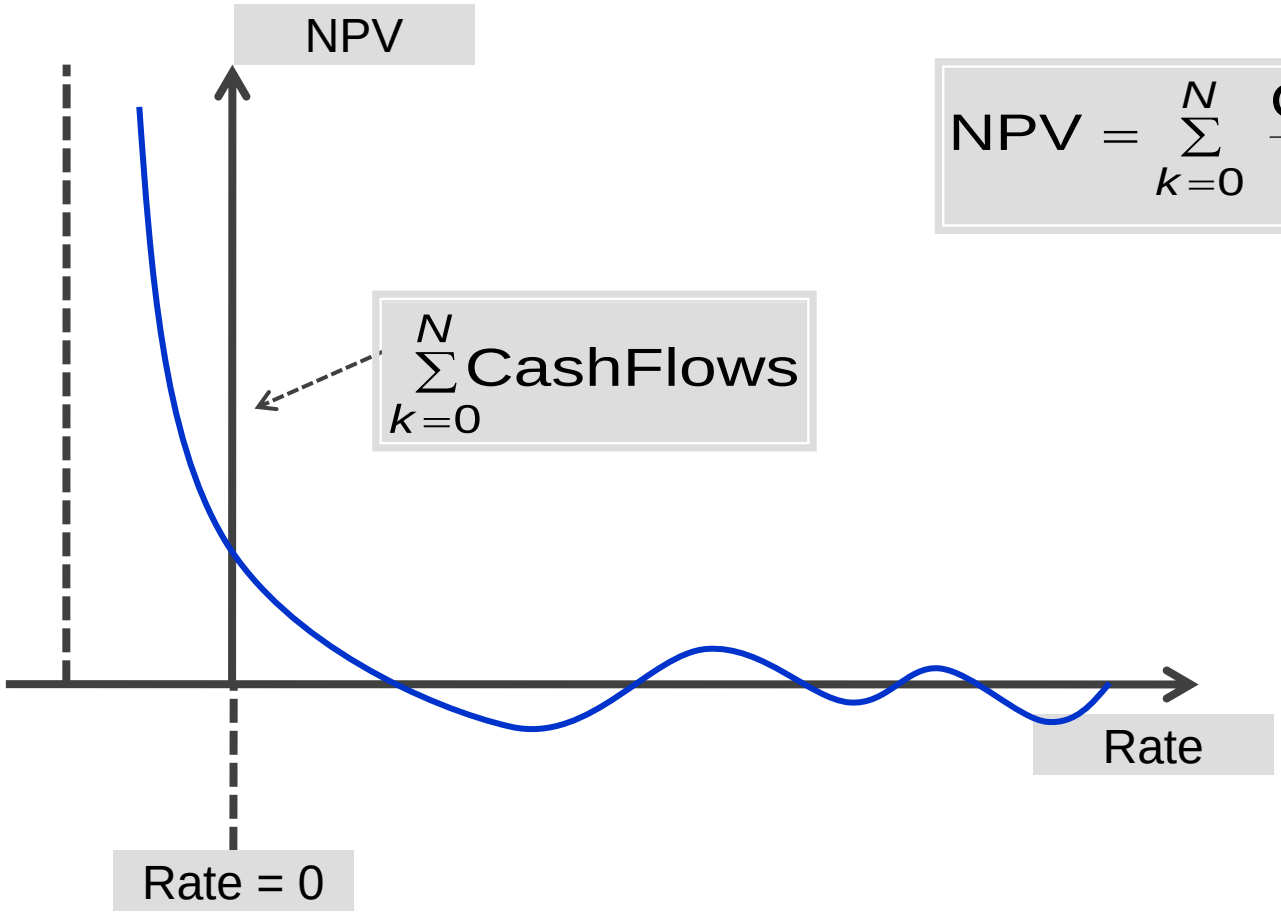
NPV versus IRR



Net Present Value – Project NPV



Multiple Solutions IRR



$$NPV = \sum_{k=0}^{N} \frac{CashFlows}{(1+rate)^k}$$

Project MIRR

MIRR is defined as the discount rate that forces the present value of cash in flows (CIF) to equal the present value of cash out flows (COF).

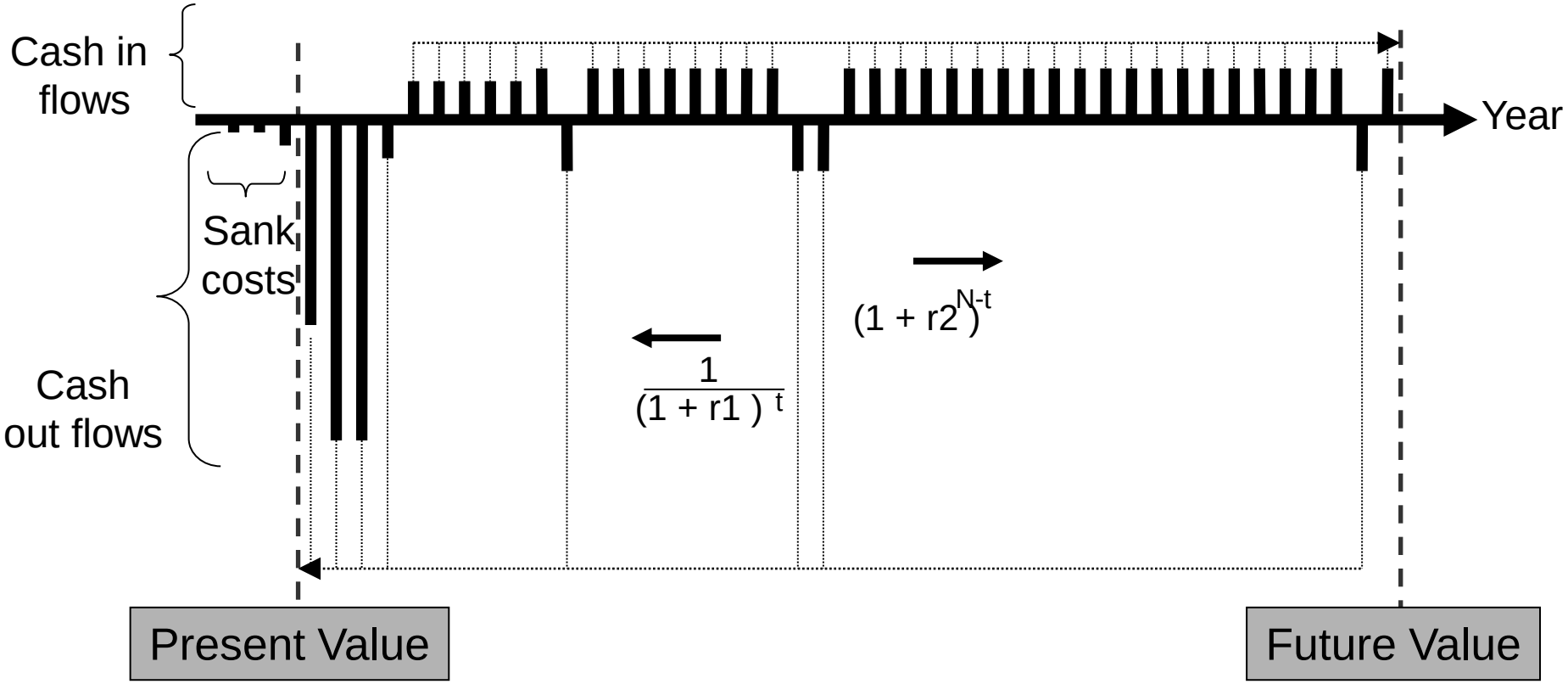
$$\sum_{t=0}^{N} \frac{COF_t}{(1+r1)^t} = \frac{\sum_{t=0}^{N} CIF_t (1+r2)^{N-t}}{(1+MIRR)^N}$$

Implication

- MIRR is better than IRR because it reinvest the cash-in flows by using the cost of capital which is more realistic. Thus, MIRR tells more accurate profitability of the project.
  - **MIRR > Hurdle Rate**: the project will produce more cash than the necessary amount to repay debt and deliver dividend to shareholders.
- MIRR is better than IRR because it allows more than one changes in plus and minus signs in cash flow projection.

Modified Internal Rate of Return - MIRR

$$(1 + \text{MIRR})^N = \frac{\text{FutureValueofCashInFlows}}{\text{PresentValueofCashOutFlows}}$$



Profitability Index - PI

The Profitability Index is a Benefit Cost Ratio

$$PI = \frac{\text{PVofFutureCashFlows}}{\text{Initial Investment}} = \frac{\sum_{t=0}^{N} \frac{CIF_t}{(1+r)^t}}{\sum_{t=0}^{N} \frac{COF_t}{(1+r)^t}}$$

PI tells the relative profitability of the project by indicating the value of the future cash flows with respect to the initial investment.

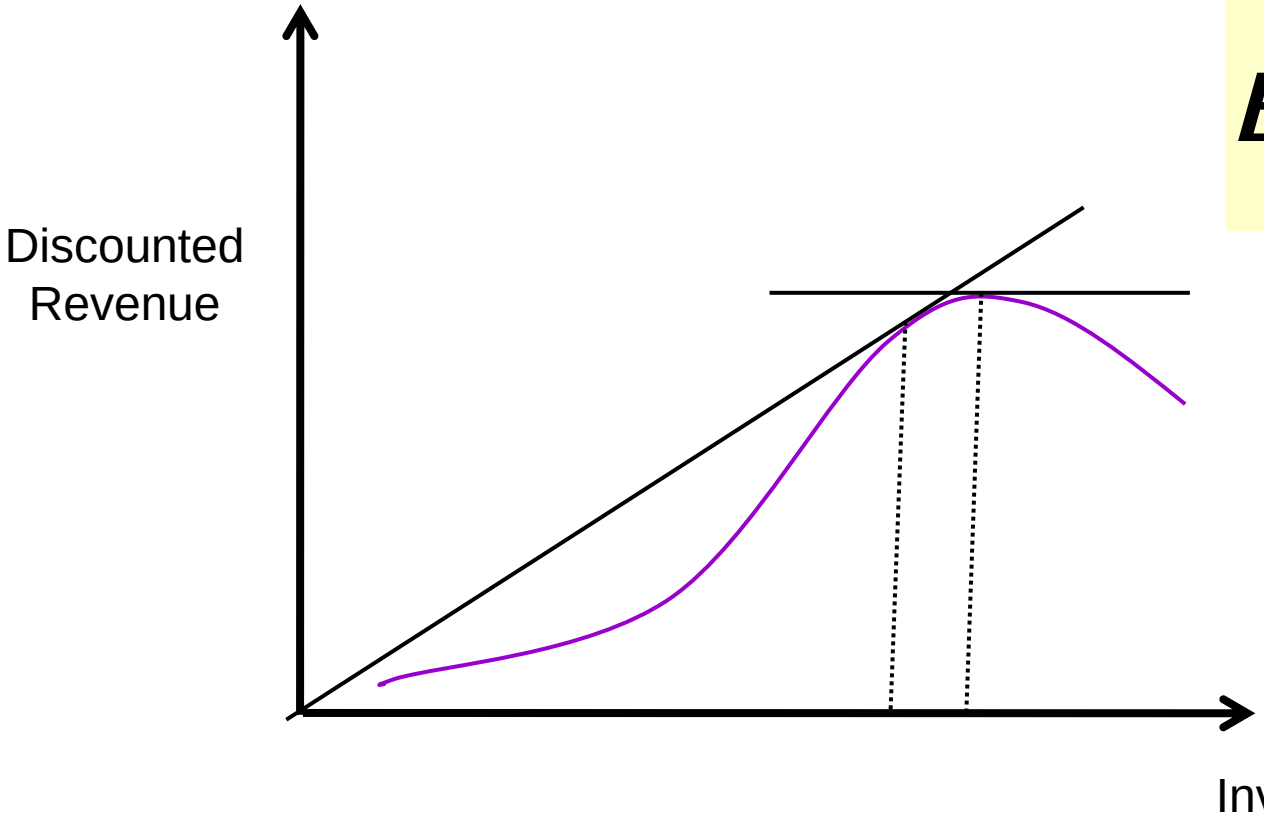
PI > 1, the project should be accepted.

PI = 1, this basically means NPV = 0 and MIRR = Hurdle Rate.

Example: investment 3M, to get year 1: 1,5M, year 3: 2,25M

with a discount rate of 12%, NPV = 2,94M and PI = 2,94/3 = 0,98

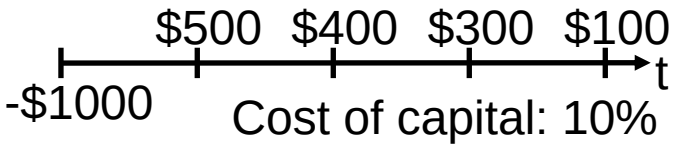
Profitability Index



$$E = \frac{R}{I}$$

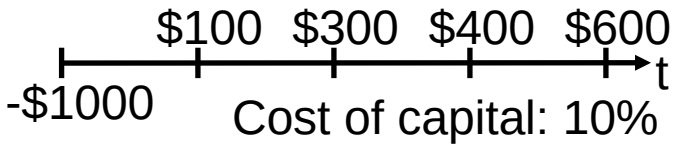
Comparing two projects with NPV and IRR

Project A

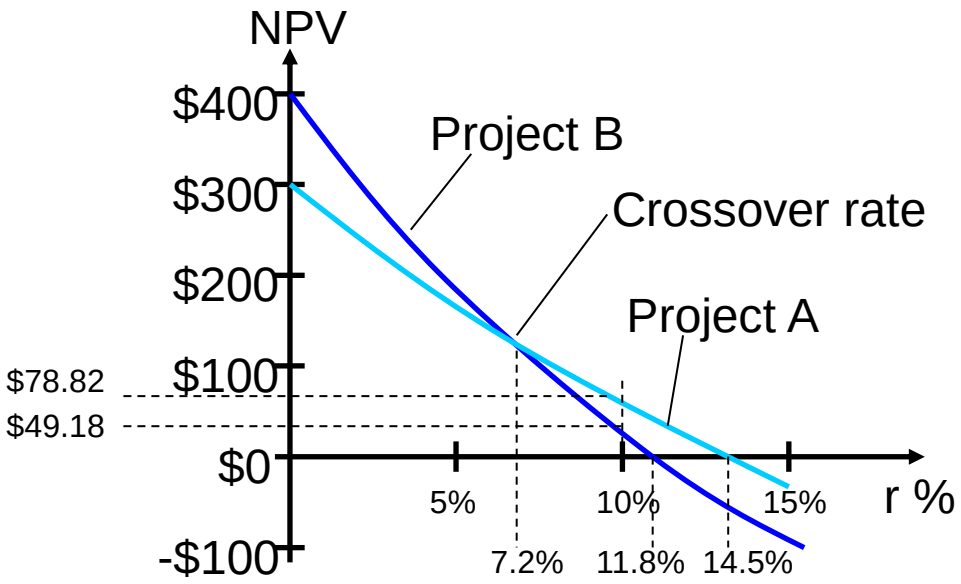


NPV: $78.82 IRR: 14.5%
MIRR: 12.1% PI: 1.08

Project B



NPV: $49.18 IRR: 11.8%
MIRR: 11.3% PI: 1.05



A conflict between NPV and IRR when:
(1) Project size differences exist
(2) Timing differences exist
below crossover rate.

Take NPV rather than IRR. The logic is That NPV selects the project that adds most to shareholder's wealth.

NPV and IRR Ordering

Project	0	1	2	3	NPV	IRR
A	-100	50	100	500	380,252	110%
B	-200	600	100	50	451,023	218%
C	-300	100	700	100	418,499	76%
A+B	-300	650	200	550	831,275	167%
B+C	-500	700	800	150	869,522	119%
A+C	-400	150	800	600	798,752	87%

NPV and IRR Compared

NPV	IRR
Measure the increase in shareholder value in dollars	Compared to the required rate of return (the hurdle rate)
Absolute measure	Relative measure
Produces consistent ranking	Non conventional cash flows can gives multiple IRR
Superior measure for mutually exclusive projects	Inferior measure for mutually exclusive projects
Assumes reinvestment a the discount rate	Assumes reinvestment at the IRR rate
More realistic	Less realistic

When IRR and NPV disagree, choose the project with highest NPV

PaybackPeriod

Payback period is the length of time required (N) to recover the cost of an investment : how long does it take for the investment to break even ?

$$\sum_{k=0}^{N} F_k > 0$$

The investment with the shorter payback period is considered the better investment. The shorter payback period is preferred because the investment costs are recovered sooner and are available again for further use and shorter period is viewed as less risky

(uncertainty of positive returns on the long term)

There are two main problems with the payback period method:

It ignores any benefits that occur after the payback period and, therefore, does not measure profitability.
It ignores the time value of money

Discounted Payback Period

Pay-off or pay-out period : D

Duration required to get back the initial investment amount

This is done with discounted cash flows

$$\sum_{k=0}^{D} \frac{F_k}{(1+rate)^k} > 0$$

The best project has the lowest pay-out time.

6-Loans

Loans with constant annuity

Given the following loan:

- Definition with 4 data: Capital, Rate, Period, Duration

- Calculate the constant annuity: A
- Amortization Table
- Formulas

- Use of Excel Financial Functions
- Use of Solver
- Use of Table Function for simulations

Principle of a Loan

Contractual Data are :

- Capital : C in currency
- Annual interest rate: R in %/year
- Periodicity : P in number of periods per year
- Duration of the loan: N number of periods

In order to get:

- Constant Annuity : A in currency
- List of Interest : I (1..n)
- List of Amortization: A (1..n)
- List of Outstanding Capital: OC (1..n)
- List of Discount Factors: DF(1..n)

First Fundamental Form

Principle:

- The Capital is equal to the sum of discounted annuities.
- The discount rate is the rate of the loan

$$C = \sum_{k=1}^{n} \frac{A}{(1+t)^k}$$

The formula with p, when the period is different from the year: we divide the rate by p to get a periodic rate.

$$C = \sum_{k=1}^{n} \frac{A}{(1+t/p)^k}$$

Second Fundamental Form

Principle:

- The Present Value of Interests

equals

- The Present Value of Capital Flows

$$C - \sum_{k=1}^{n} \frac{A_k}{(1+t)^k} = \sum_{k=1}^{n} \frac{I_k}{(1+t)^k}$$

The Cost for the Bank is equal to the Cost for the Creditor

The CASH FLOW VIEW

Third Fundamental Form

The Cost of a LOAN is the discounted Value of Interests

$$\sum_{k=1}^{n} \frac{I_k}{(1+t)^k} = \mathrm{C} - \sum_{k=1}^{n} \frac{A_k}{(1+t)^k} = Rate. \sum_{k=1}^{n} \frac{OC_k}{(1+t)^k}$$

$$Rate = \frac{\mathrm{C} - \sum_{k=1}^{n} \frac{A_k}{(1+t)^k}}{\sum_{k=1}^{n} \frac{OC_k}{(1+t)^k}}$$

Numerator: Cost for the Bank

Denominator: Payment Schedule

The RATE VIEW

Principle

Question: How to get A from the following equation:

$$C = \sum_{k=1}^{n} \frac{A}{(1+t)^k}$$

Answer: use the sum of a geometric serie with factor q equal to :

$$q = \frac{1}{1+t}$$

Geometric Sum

To get : $S = \sum_{k=m}^{n} q^k$

$$S = \frac{q^m - q^{n+1}}{1-q}$$

$$\begin{aligned} S &= q^m + q^{m+1} + \cdots + q^n + 0 \\ S.q &= 0 + q^{m+1} + \cdots + q^n + q^{n+1} \\ \hline S - S.q &= q^m - q^{n+1} \end{aligned}$$

Applied to Loan:

$$\sum_{k=1}^{n} q^k = \frac{q - q^{n+1}}{1-q} \qquad \sum_{k=0}^{\infty} q^k = \frac{1}{1-q}$$

$$q = \frac{1}{1+t} \qquad 1 - q = \frac{t}{1+t} \qquad \frac{1}{1-q} = \frac{1+t}{t}$$

$$\sum_{k=1}^{n} \frac{1}{(1+t)^k} = \frac{1-q^n}{1/q - 1} = \frac{1-(1+t)^{-n}}{t}$$

Constant Annuity

Solution

$$C = \sum_{k=1}^{n} \frac{A}{(1+t)^k} = \frac{1-(1+t)^{-n}}{t} . A$$

$$A = \frac{t}{1-(1+t)^{-n}} . C = \frac{t}{1-\frac{1}{(1+t)^n}} . C$$

With period p:

$$A = \frac{t/p}{1-(1+t/p)^{-n}} . C$$

Constant Annuity - Formulas

Interests are calculated on OC

$$I_k = OC_k . t . d$$

Amortization are decreasing the OC

$$OC_{k+1} = OC_k - A_k$$

Amortization is increasing with (1+t) factor :

$$A_k = \frac{C . t . (1+t)^{k-1}}{(1+t)^n - 1} = \frac{A}{(1+t)^{n-k+1}}$$

$$\frac{A_{k+1}}{A_k} = (1+t)$$

Outstanding Capital (OC)

$$\mathrm{OC_k} = \frac{\mathrm{A.}\,(1-(1+\mathrm{t})^{-(\mathrm{n}-\mathrm{k})})}{\mathrm{t}} = \sum_{k=1}^{n-k} \frac{A}{(1+t)^k}$$

Interests based on OC:

$$\mathrm{I_k} = \mathrm{A.}\,(1-(1+\mathrm{t})^{-\mathrm{n}+\mathrm{k}})$$

First Period Formulas

First Period: $I_1 = C.t$

$$A_1 = \frac{C.t.(1+t)^{1-1}}{(1+t)^n - 1} = \frac{C.t}{(1+t)^n - 1} = \frac{I_1}{(1+t)^n - 1}$$

Outstanding Capital (OC)

$$OC_1 = \frac{A.(1-(1+t)^{-(n-1)})}{t} = \sum_{k=1}^{n-1} \frac{A}{(1+t)^k} = C - \frac{A}{(1+t)^n}$$

$$OC_1 = C - \frac{C.t}{(1+t)^n - 1} = C.\frac{(1+t)^n - (1+t)}{(1+t)^n - 1}$$

First Period Formulas

In cases where the capital is issued on several periods, how to calculate the amortization table.

A not elegant solution is to set up one loan for each capital issued.

A better solution is to be able, either to calculate each annuity An with the PMT function based on

the last “remaining capital” or OC

and with the remaining number

of years k

$$\frac{OC_{k-1}.\mathrm{t}}{(1-(1+\mathrm{t})^{-\mathrm{k}}}$$

Or either to directly calculate the

Capital payed back with :

$$\frac{OC_{k-1}.t}{(1+\mathrm{t})^{\mathrm{k}}-1}$$

Cost of a Loan

The cost of a loan is equal to the net present value of the interest.

$$\text{Cost} = \sum_{k=1}^{n} \frac{I_k}{(1+t)^k}$$

The sum of interest (non discounted) is equal to the sum of annuities minus the Capital C.

$$\sum_{k=1}^{n} I_k = n.A - C$$

$$\text{Cost} = \sum_{k=1}^{n} \frac{I_k}{(1+t)^k} = C - \frac{n.A}{(1+t)^{n+1}}$$

Constant Annuity - Formulas

Sum of Discounted Amortization:

$$\sum_{k=1}^{w} \frac{A_k}{(1+t)^k} = \sum_{k=1}^{w} \frac{A}{(1+t)^{n+1}} = \frac{A.w}{(1+t)^{n+1}}$$

$$\sum_{k=1}^{n} \frac{A_k}{(1+t)^k} = \frac{A.n}{(1+t)^{n+1}}$$

Sum of discounted interests:

$$\sum_{k=1}^{w} \frac{A}{(1+t)^k} = \sum_{k=1}^{w} \left(\frac{I_k}{(1+t)^k} + \frac{A_k}{(1+t)^k}\right)$$

$$\sum_{k=1}^{w} \frac{I_k}{(1+t)^k} = \sum_{k=1}^{w} \frac{A-A_k}{(1+t)^k} = \sum_{k=1}^{w} \frac{A}{(1+t)^k} . \left(1 - \frac{1}{(1+t)^{n-k+1}}\right)$$

$$= A \sum_{k=1}^{w} \left(\frac{1}{(1+t)^k} - \frac{1}{(1+t)^{n+1}}\right)$$

$$\sum_{k=1}^{w} \frac{I_k}{(1+t)^k} = A\left(\frac{1-(1+t)^{-w}}{t} - \frac{w}{(1+t)^{n+1}}\right)$$

$$\sum_{k=1}^{n} \frac{I_k}{(1+t)^k} = C - \frac{A.n}{(1+t)^{n+1}}$$

Excel Functions around LOANS

Excel Functions have similar arguments:

PMT	(**rate,years,amount,**fut val,type)
NPER	(**rate,annuity,amount,**fut val,type)
RATE	(**years,annuity,amount,**fut val,type)
IPMT	(**rate,rank,duration,amount,**fut val,type)
PPMT	(**rate,rank,duration,amount,**fut val,type)
FV	(**rate,years,amount,**present val,type)
PV	(**rate,years,amount,**fut val,type)

Arguments

Annuity	Constant Periodic Payment
Rate	Periodic rate
Years	Number of Periods
Present value	Initial Payment
Future value	Last Payment
Rank	Number of annuity
Type	Payment at end of period : type =0 (défaut) Payment at beginning of period : type=1

Amortization Tables

Principles

- Interest is equal to CR multiplied by Rate and period duration.
- An Annuity is the sum of the Interest and the Amortization.
- The Remaining Capital RC of period N+1 is equal to RC of period N minus the Amortization of the period.
- The Remaining Capital of the last installment is equal to zero.

These rules allow us to build up the full amortization table

Amortization Table

Outstanding Capital	**Interest**	**Amortization**	**Constant Annuity**
OC (k)	**I (k)**	**A (k)**	**A**
OC(0)=C OC(n)=0	OC x Rate	OC(n)-OC(n-1)	I(k) + A(k)
Decreasing	Decreasing	Increasing	Constant

Solver

Principle

- With a link between a source cell and a target cell
- Define a target value for the target cell
- Modify the source cell in order for the target cell to reach the target value

3 Parameters

- Reference Cell
- Target Cell
- Target Value

Loan with constant annuity

Calculate Annual constant Annuity of this loan

- Capital 100 000 usd
- Annual Rate 3%
- Duration 10 years

Use also rounding functions to the nearest cent.

TABLES

TABLE IN CURRENT CURRENCY					TABLE IN CONSTANT CURRENCY			
OC	INTEREST	CAPITAL	ANNUITY	DF	OC	INTEREST	CAPITAL	ANNUITY
100000,00	3 000,00	8 723,05	11 723,05	0,9709	97087,38	2 912,62	8 468,98	11 381,60
91 276,95	2 738,31	8 984,74	11 723,05	0,9426	86 037,28	2 581,12	8 468,98	11 050,10
82 292,21	2 468,77	9 254,28	11 723,05	0,9151	75 309,03	2 259,27	8 468,98	10 728,25
73 037,92	2 191,14	9 531,91	11 723,05	0,8885	64 893,25	1 946,80	8 468,98	10 415,78
63 506,01	1 905,18	9 817,87	11 723,05	0,8626	54 780,84	1 643,43	8 468,98	10 112,41
53 688,14	1 610,64	10 112,41	11 723,05	0,8375	44 962,97	1 348,89	8 468,98	9 817,87
43 575,73	1 307,27	10 415,78	11 723,05	0,8131	35 431,06	1 062,93	8 468,98	9 531,91
33 159,95	994,80	10 728,25	11 723,05	0,7894	26 176,77	785,30	8 468,98	9 254,28
22 431,70	672,95	11 050,10	11 723,05	0,7664	17 192,03	515,76	8 468,98	8 984,74
11 381,60	341,45	11 381,60	11 723,05	0,7441	8 468,98	254,07	8 468,98	8 723,05
0,00				0,7224	0,00			
					510			
TOTAL	17 230,51	100 000,00	117 230,51	8,5302	339,5921	15 310,19	84 689,81	**100 000,00**

Perpetual Increasing

PERPETUAL INCREASING

Rate of increase: g

$$NPV = \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4} + \ldots\ldots\ldots$$

$$NPV = \frac{C_1}{(1+r)} + \frac{C_1(1+g)}{(1+r)^2} + \frac{C_1(1+g)^2}{(1+r)^3} + \ldots.$$

$$NPV = \frac{C_1}{(1+r)} \frac{1}{1-\frac{(1+g)}{(1+r)}} = \frac{C_1}{(1+r)-(1+g)}$$

$$NPV = \frac{C_1}{r-g}$$

Demonstration of increasing annuity

$$Capital = \frac{A}{(1+r)} + \frac{A(1+g)^1}{(1+r)^2} + ... + \frac{A(1+g)^{n-1}}{(1+r)^n}$$

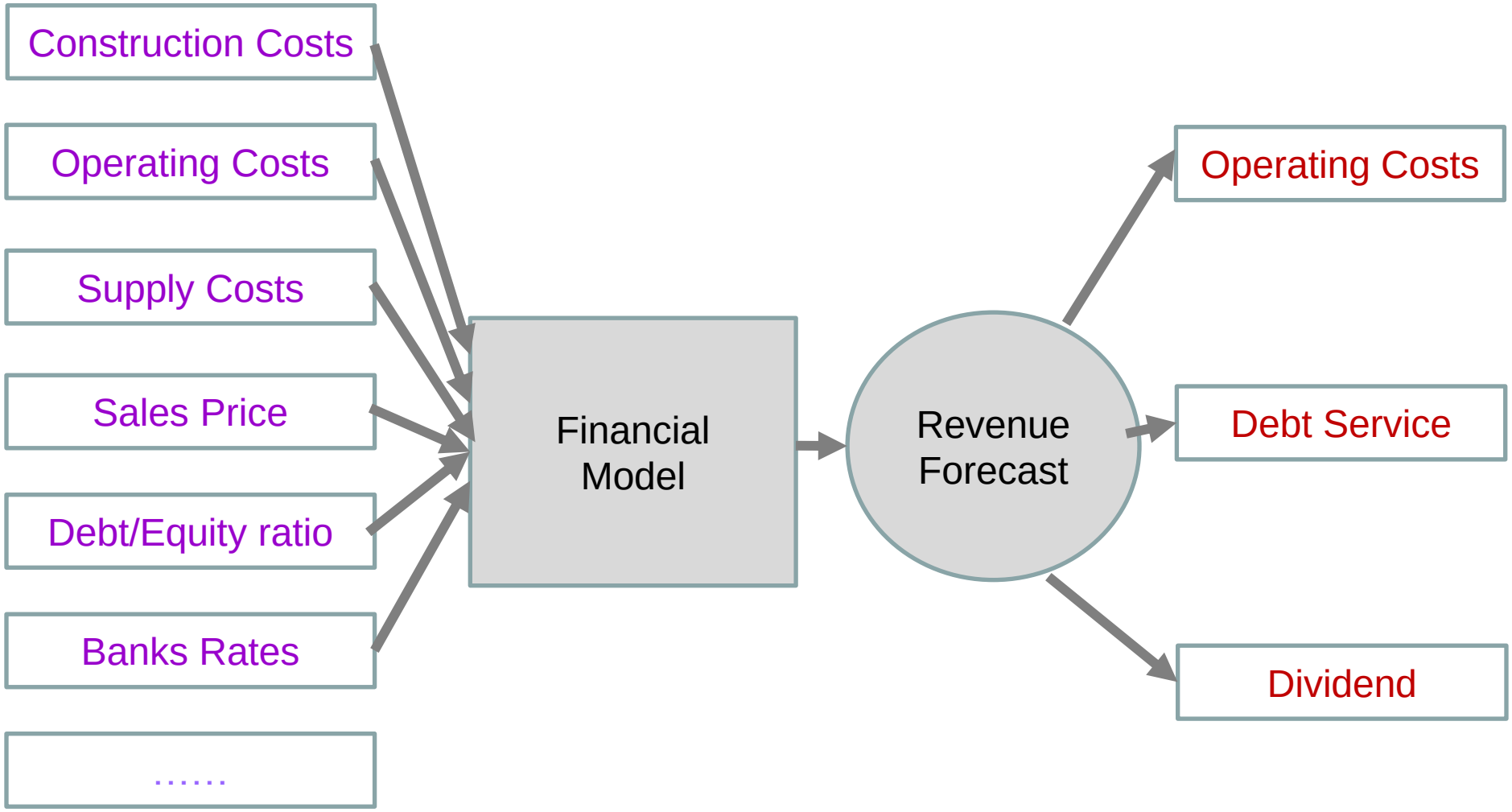
$$Capital = \frac{A}{(1+g)} \sum_{k=1}^{n} \frac{1}{\left(\frac{(1+r)}{(1+g)}\right)^k}$$

CAPITAL AJUSTED $\quad \frac{A}{1+g}$

RATE AJUSTED $\quad \frac{1+r}{1+g}$

7. Project Modeling

Financial Model



Modeling

Modelling with Excel.

These are the benefits of using Excel for Modeling

- Available tools
- No need to do coding
- Simulations possible

- Can be used at an advanced level with optimization
- Use of circularity

Modeling

Modeling objectives:

1 – Simulate the Future Cash Flows

until the real final cash account

2 - Simulate the accounting reports

Income Statement

Balance Sheet

Cash Flow Statement

3 – Calculate Debt and Project Ratios

4 – Do Simulations to estimate the project risk

This means we must clearly splits the input data from the output data.

Modeling

Modeling objectives:

It is very important to have the 2 sides of a project:

The Economic View through the cash flow simulations

The Accounting View through the 3 accounting reports

Because both are very much mixed, in particular

- For accounting depreciation
- For accounting earnings and taxes
- To simulate the termination with economic hypothesis and not accounting one.

Modeling

Modeling objectives:

It is also important to be able to separate:

- The operational project in order to get an operational return on Asset: ROA
- The financial part of the project to give a global return on Equity: ROE

This is due to the fact that the banking debt provides a huge leverage effect if the cost of the debt is lower than the project return (ROA).

Modeling

Modeling parts:

Time Frame: periodicity and duration – maturity date

- "mixed time frame"
- different phases: investment, production, termination
- defined averages over periods
- suppose payment at end of periods

Define project hypothesis:

- with constants for all project
- or variable data on each period

Units: volumes and quantities for the productions, currencies

Inflation: constant money versus current money

Modeling

Constant money versus current money

Current prices are those indicated at a given moment in time, and said to be in nominal value.

Constant prices are in real value, i.e. corrected for changes in **prices** in relation to a base line or reference datum.

Banking payments are fixes in current price (but decrease in constant prices)

Cost are increasing in Current Prices and could be constant in constant prices.

Project Simulations are done in current prices

Modeling

Modeling parts:

Financial loans simulations with various depreciation hypothesis: linear, constant annuity, zero coupon

Working Capital to take into account differences between “earnings” and “cash flows”.

VAT with differed payments

TAXES with differed payments

Dividend subject to many conditions

Reserve accounts

Modeling

Modeling parts:

Investment

Production

Cost

Selling

Working Capital

Payments

VAT

Taxes

Dividend

Modeling

Modeling parts - Accounting

Cash Flow Statement:

Revenues, Total Cost, Tas, Variation Working Capital, Capital

Equity, Long term Debt, Debt Interest, Short Term interest, Taxes, Dividends

Income Statement:

Revenues, Total Cost, Taxes, Depreciation, Long Term Interest, Short Term Interest, Taxes, Dividend

Balance Sheet:

Asset: Net Capital, Positive Cash Account, Working Cap

Liabilities: Negative Cash Account, Debt, Equity, Reserve, Working Capital, Dividend, Cumulative P&L

Modeling

1-Define project hypothesis

All hypothesis will be defined on a separate worksheet or on top of the worksheet

RULE 1 : Separation of DATA and MODELING

No constant will appear into formulas

Modeling

2-Link all calculation from beginning to end

The project is presented in LINES

All calculation refer only to “previous” lines (above lines)

Lines are copies of the constants

Lines are calculated from previous lines

As much as possible, use NAMES to refer to previous lines

RULE 2 : in a sheet, all calculations are from top to bottom

Modeling

3-To make the controls easier and calculation explicit

All formulas are based on names

This means that all the lines have a name

We use the excel function INDIRECT to copy previous lines

RULE 3 : all lines have an explicit name

Use the different and easy ways to name quickly a line

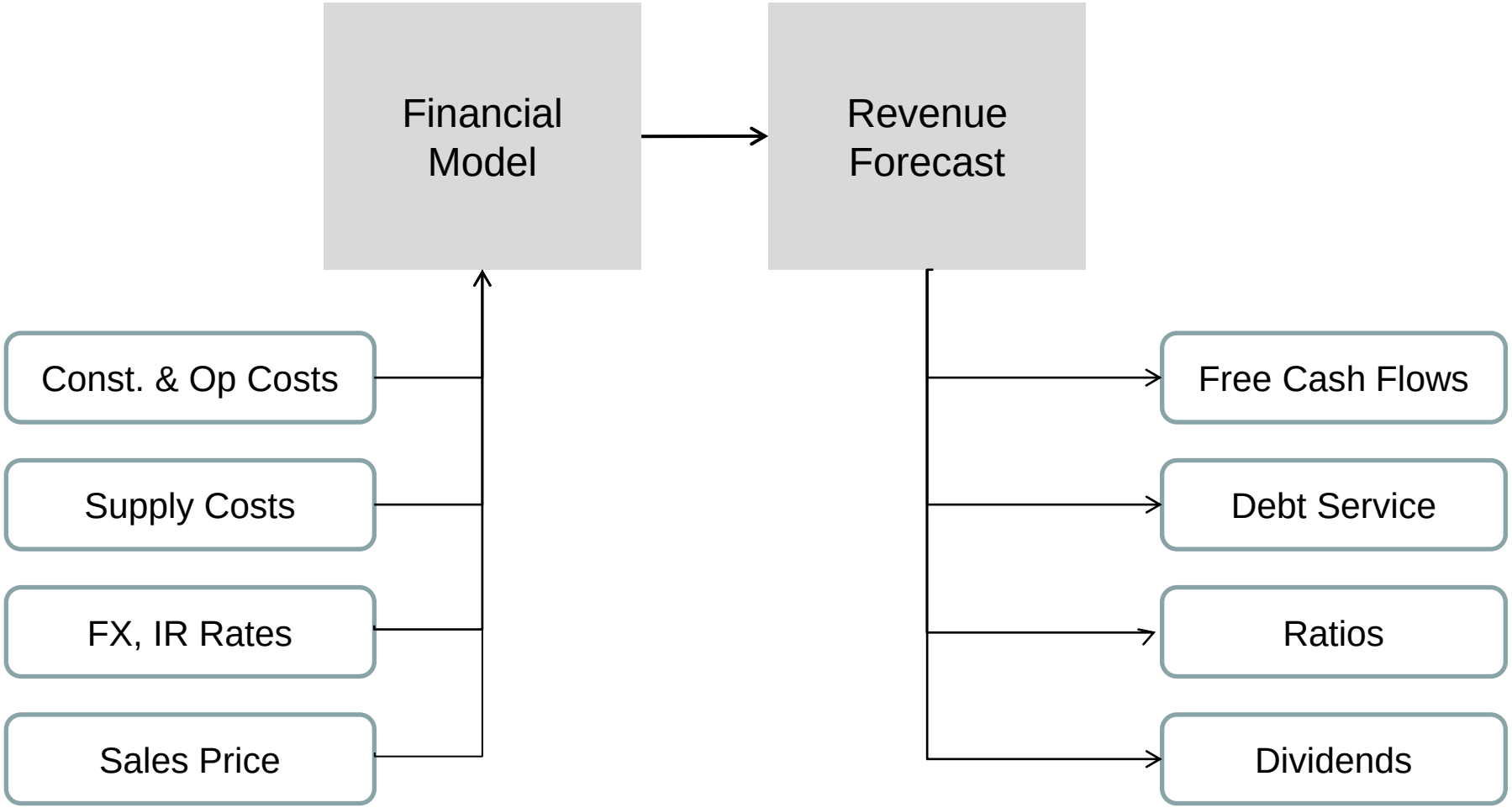
- Directly into the “name box”
- With selecting data and name (on left or right)

Modeling Hypothesis

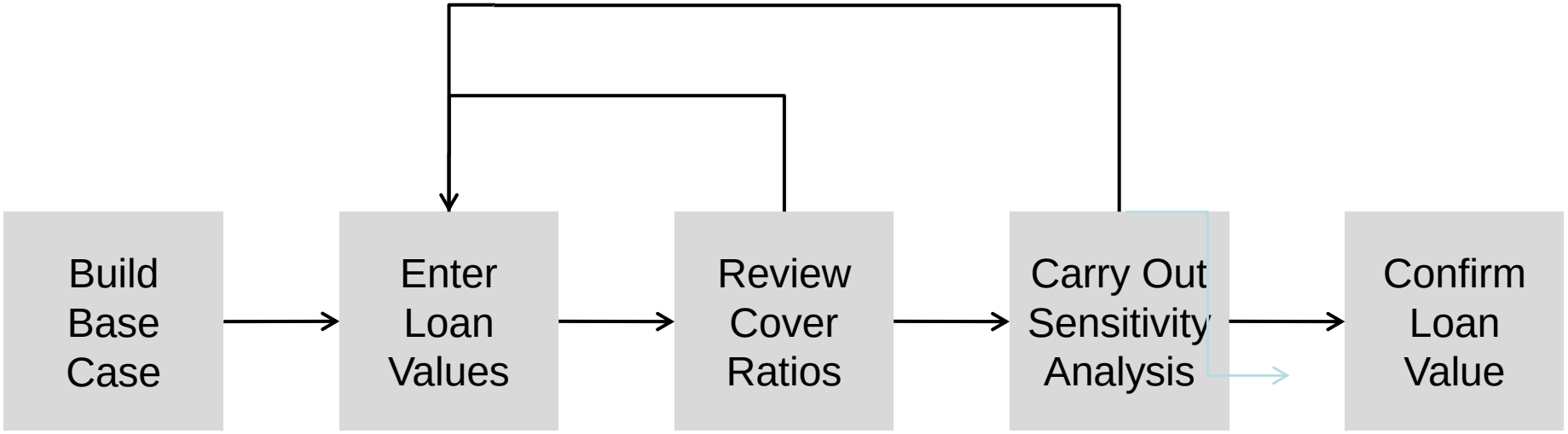
- Frequency of the model: year/month…
- Duration of different phases
- Investment: ratios and depreciation
- Production: volumes, capacity
- Sales: growth
- Costs: cogs with indexes
- Bank loans: rate, duration, amortization
- Selling: volumes and prices
- Taxes with deferred payments
- Reserve policy
- Dividend policy: payout dividend ratio

Project Modeling

Project Modeling:



Debt capacity analysis



Project Modeling

Project Modelling:

To estimate future cash flows by simulation

Two Cycles:

- Investment “short” Cycle: initial investment cost
- Operational Cycle: the industrial component
  - Estimate Capacity: potential and in use
  - Estimate Volumes produced/sold (inventories)
  - Estimate Operational costs
  - Estimate Selling Prices in local and foreign currency
- Financial Cycle: for the initial and operational funding
  - If fixed rate calculate interests
  - Calculate the amortizing schedules

DAM MODELING - INPUT

1 – Add a line between 82 and 83:

CFCap = - Capex + Amort

2 – Calculate cost of Loans

Add 2 lines after Interest Amortization Outstanding (167 or 168)

168: CFDT=Amortization: a difference line on Outstanding

169: CFDBT = CFDT + IntLT

Calculate IRR on line 169

Average cost of Debt = 4,0142%

3 – Change Input Line 18

Input = 50% decrease every 5 years: 2029 2034 2039 2044 2049

DAM MODELING - INPUT

4 – DSCR and CFADS

Replace PLPROD and AMORT by CFOP and Capex

Do the sum as CFADS

5 – CFADS

Calculate NPV of CFADS at:

start date and start date of production

SUM = 830 215,41

NPV Start Date = 253 898,71

NPV Start Production = 373 060,50

6 – Calculate NPV of CFADS from

the last period of the project

the maximum loan maturity date

DAM MODELING - INPUT

7 – Calculate sum of LT Interest and Principal Repayment

Calculate NPV:

Sum of loan payments = 352 372,26

NPV of loan payments = 151 812, 85

Sum of Interests = 103 625,76

Cost of loans = 75 001,04

8 – Calculate DSCR each year

minimum and average

9 – Calculate LLCR and PLCR each year

minimum and average

10 – Calculate Debt Ratio

OIL MODELING - INPUT

3 Project Durations

Inflation

Price

Capacity Availibility

Fix and Variable Costs

Capex Capfi Equity

3 Amortisation

Loan: duration, rate

Cash Account: depo funding

Tax Corp

Reserve: rate, year

Dividend: rate

Discount rate

OIL MODELING - FORECAST

FINKEYS FRANCE

1 – TIME FRAME

Period Flag

Inflation Factor

1 on the first year

2 - REVENUES

Production (volume:barrel/year)

capacity – availability

Price

inflation adjusted

Revenue

Production x Price

NPV=165 260 834, 38

3 – COSTS

Fixed costs: inflation adjusted

Variable costs: inflation adjusted on Production (volume)

NPV=84 691 524,96

4 – WORKING CAPITAL

Days per year: 365

On receivable: 30 days

On payable: 7 days

Calculate net

Calculate difference for CF

NPV=2 851 987,88

OIL MODELING - FORECAST

FINKEYS FRANCE

5 – INVESTMENT

Split into 3 phases

Inflation Adjusted

NPV=58 131 404, 96

Sum of Investment

Total year end= 73 207738,65

6 – AMORTIZATION

Degressive mode for each investment

NPV=42 526 223,55

7 – FINANCING

Equity

- cash flows
- balance sheet

Debt

- repayments
- outstanding debt
- interest
- cash flow = annuity

Sum of Interest: 11 900 000

Cost of Loan: 9 464 465,20

OIL MODELING - FORECAST

8 – TAX CORP

Taxes are based on cumulated PL before Tax.

Taxes are paid one year after

NPV of paid taxes=

7 982 311,15

Working Capital must also be adjusted

9 – DIVIDEND

Dividends are paid one year after

NPV of paid dividend=

23 946 933,46

Working Capital must also be adjusted

10 – CASH ACCOUNT

The cash account is always positiv due to excess cash on the first year:

Interest received are paid the next year:

0,00
1 500 000,00
827 064,71
211 229,89
680 283,82
753 054,19
1 198 390,91
1 544 326,14

OIL MODELING - TAXES

TAX CORP	PLBEFTAX	0	753 200	127 861	10 983 470	14 999 671	18 148 638	4 325 655	844 326	
		0	753 200	881 061	11 864 530	26 864 201	45 012 839	49 338 494	50 182 820	PLBEFTAXCUM
		0	753 200	127 861	10 983 470	14 999 671	18 148 638	4 325 655	844 326	
		0	-188 300	-31 965	-2 745 867	-3 749 918	-4 537 159	-1 081 414	-211 082	TAXCO
		0	-188 300	-220 265	-2 966 133	-6 716 050	-11 253 210	-12 334 624	-12 545 705	
	-7 982 311,15	0	0	-188 300	-31 965	-2 745 867	-3 749 918	-4 537 159	-1 081 414	TAXCOPAY
		0	188 300	31 965	2 745 867	3 749 918	4 537 159	1 081 414	211 082	WCTAX
		0	188 300	-156 335	2 713 902	1 004 050	787 242	-3 455 746	-870 332	CFWCTAX

OIL MODELING - DIVIDEND

DIVIDEND	RATEDIVIDEND	100%	100%	100%	100%	100%	100%	100%	100%	
	PLAFTERTAX	0	564 900	95 896	8 237 602	11 249 753	13 611 478	3 244 241	633 245	
		0	564 900	95 896	8 237 602	11 249 753	13 611 478	3 244 241	633 245	
	CFBEFDIV	30 000 000	-13 458 706	-11 751 796	9 476 974	9 693 010	20 156 487	20 530 183	-39 096 694	
		30 000 000	16 541 294	4 789 498	14 266 472	23 959 482	44 115 969	64 646 152	25 549 458	
		0	-564 900	-95 896	-8 237 602	-11 249 753	-13 611 478	-3 244 241	-633 245	DIVIDEND
	-23 946 933,46	0	0	-564 900	-95 896	-8 237 602	-11 249 753	-13 611 478	-3 244 241	DIVIDENDPAY
		0	564 900	95 896	8 237 602	11 249 753	13 611 478	3 244 241	633 245	WCDIV
		0	564 900	-469 004	8 141 707	3 012 151	2 361 725	-10 367 237	-2 610 997	CFWCDIV

DAM MODELING - AMORTIZATION

Bank Amortization:

- Linear, based on duration of loan
- Constant Maturity: $A_k = \frac{C.t.(1+t)^{k-1}}{(1+t)^n-1} = \frac{A}{(1+t)^{n-k+1}}$
- Adjusted to DSCR: repayment = DSCR/DSCR Target

Best Practice: to first calculate **Principal Payment.**

Excel Modification: how to convert Annuity into Principal Payment?

Simply by subtracting the interest from the Annuity, because interest is calculated on previous year outstanding

DAM MODELING - AMORTIZATION

Fixed Asset Amortization:

- Linear, based on duration of loan
- Degressiv

<u>Excel Linear Method:</u>

Line1: FLOWS : list of investment cash flows

Line 2: SUM : sum of line1

Line 3: BASE : line1 – line 4

Line 4: AMORT : max(SUM/T;BASE(-1))

DAM MODELING - AMORTIZATION

LINEAR	AMORTIZATION WITHOUT ENDING								
FLOWS	40 000,00	10 000,00							
SUM	40 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	=H5+I4
BASE	32 000,00	32 000,00	22 000,00	12 000,00	2 000,00	-8 000,00	-18 000,00	-28 000,00	=H6-I7+I4
AMORT	8 000,00	10 000,00	10 000,00	10 000,00	10 000,00	10 000,00	10 000,00	10 000,00	=I5/5
	AMORTIZATION WITH ENDING								
SUM	40 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	=H9+I15
BASE	32 000,00	32 000,00	22 000,00	12 000,00	2 000,00	0,00	0,00	0,00	=H10-I11+I15
AMORT	8 000,00	10 000,00	10 000,00	10 000,00	10 000,00	2 000,00	0,00	0,00	=MIN(I9/5, H10)

DAM MODELING - AMORTIZATION

Excel Degressiv Method without termination:

Line1: FLOWS : list of investment cash flows

Line 3: BASE : line1 – line 4

Line 4: AMORT : BASE/T

Also with coefficient;

3-4 years: 1,25

5-6 years: 1,75

Over 6: 2,25

Termination: A: remaining at date T

B: max of degressiv with coeff and linear

DAM MODELING - AMORTIZATION

	AMORTIZATION WITHOUT								
DEGRESSIV	**ENDING**								
FLOWS	40 000,00	10 000,00							
									=H16-
BASE	40 000,00	42 000,00	33 600,00	26 880,00	21 504,00	17 203,20	13 762,56	11 010,05	H17+I4
AMORT	8 000,00	8 400,00	6 720,00	5 376,00	4 300,80	3 440,64	2 752,51	2 202,01	=I16/5
	AMORTIZATION WITH ENDING								
									=H19-
BASE	40 000,00	42 000,00	33 600,00	26 880,00	21 504,00	17 203,20	0,00	0,00	H20+I15
AMORT	8 000,00	8 400,00	6 720,00	5 376,00	4 300,80	17 203,20	0,00	0,00	=G19
	CONTROLS								
SUM									
AMORT	8 000,00	16 400,00	23 120,00	28 496,00	32 796,80	50 000,00	50 000,00		
CONTROL	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00	50 000,00		

AMORTIZATION - PROJECT

PROJECT	**AMORTIZATION**		20%	5				
FLOWS	40 000,00							**40 000,00**
BASE	40 000,00	32 000,00	25 600,00	20 480,00	16 384,00	13 107,20	0,00	
AMORT		8 000,00	6 400,00	5 120,00	4 096,00	3 276,80	13 107,20	**40 000,00**
SUM AMORT		8 000,00	14 400,00	19 520,00	23 616,00	26 892,80	40 000,00	
CONTROL		**40 000,00**	**40 000,00**	**40 000,00**	**40 000,00**	**40 000,00**	**40 000,00**	
PROJECT	**AMORTIZATION**		25%	4				
FLOWS		10 300,00	10 609,00					**20 909,00**
BASE		10 300,00	18 334,00	13 750,50	10 312,88	7 734,66	0,00	
AMORT		0,00	2 575,00	4 583,50	3 437,63	2 578,22	7 734,66	**20 909,00**
SUM AMORT		0,00	2 575,00	7 158,50	10 596,13	13 174,34	20 909,00	
CONTROL		**10 300,00**	**20 909,00**	**20 909,00**	**20 909,00**	**20 909,00**	**20 909,00**	
AMORT		8 000,00	8 975,00	9 703,50	7 533,63	5 855,02	20 841,86	

DAM MODELING - CIRCULARITY

The Dam model works with circularity, because of the current account:

Make sure to have the « circularity » option ON

(in Excel Options/Formula: activate circularity)

All circularity can be resolved by solving the system of equations:

In the model:

$$Balance(n) = Balance(n-1) + CF(n) + I(n)$$

$$I(n) = rate.\ Balance(n)$$

DAM MODELING - CIRCULARITY

In the model:

Balance(n) = Balance(n-1) + CF(n) + I(n)

I(n) = rate. Balance(n)

Balance(n) = Balance(n-1) + CF(n) + rate.Balance(n)

$$Balance(n) = \frac{Balance(n-1) + CF(n)}{1 - rate}$$

What is the formula for the interest?

DAM MODELING - CIRCULARITY

In the model:

Balance(n) = Balance(n-1) + CF(n) + I(n)

I(n) = rate. Balance(n)

I(n) = rate.(Balance(n-1) + CF(n) + I(n))

$$Interest(n) = (Balance(n-1) + CF(n).\frac{rate}{1 - rate}$$

DAM MODELING - CIRCULARITY

The use of circularity can sometimes be very unstable and generate errors accross all tables in particular with following lines:

- Short term interest
- Taxes
- Dividend

A solution is to erase these lines in Cash Flow and Income Statement, until all errors disappear and copy back again these INDIRECT lines.

(can possibly be done through a macro and button).

DAM MODELING - WACC

From the WACC formula, compute the Equity return required to have the WACC equal the discount rate:

WACC = 8%

RateBank: r_E= 4,0142%

Corporate Tax Rate: t = 30%

$$WACC = \frac{E}{E+D} R_E + \frac{D}{E+D} R_D (1-t)$$

E: market value of Equity !

D: market value of Debt !

DAM MODELING - WACC

From the WACC formula, compute the Equity return required to have the WACC equal the discount rate:

WACC = 8%

RateBank: r_E= 4,0142%

Corporate Tax Rate: t = 30%

$$WACC = \frac{E}{E+D} R_E + \frac{D}{E+D} R_D (1-t)$$

E = 82 916,50

D = 248 756,50

R_E=23,57%

DAM MODELING – TAX CORP

Corporate Tax is applied to:

- REVENUES
- COSTS
- LOCAL TAXES
- AMORTIZATION
- LT INTEREST
- ST INTEREST

<u>Excel Method:</u>

Line 1: PL: PL Before Tax (EBID)

Line 2: SUM: Sum of line1

Line 3: BASE: Line 2 – Line4/TaxRate

Line 4: TAX:max (Line3*TaxRate;0)

DAM MODELING – TAX CORP

Corporate Tax “incorporated”

- REVENUES (1-t)
- COSTS & LOCAL TAXES (1-t)
- ST & LT INTERESTS (1-t)
- AMORTIZATION & DEPRECIATION t

DAM MODELING – RESERVE

Reserved (DSRA), based on N years of bank payments.

Reserve Account is like an additional Cash Account

Reserve Account is similar to Dividend without payment

Excel Method:

Line 1: Loan Cash Flow

Line 2: BAL: Balance of next N years

Use of OFFSET function to calculate the N years required based on Loan Cash Flows (Interest + Principal)

=SUM(OFFSET(CFLT;0;Inc;1;YearReserve))

Line 3: BASE: Line2 . yearprod . ReserveRate

Line 4: max(min(line3; outstanding debt, cash balance(-1));0)

Line 5: difference of line 4

DAM MODELING – DIVIDEND

Dividends are paid if:

Dividend is based on the sum of PLAfterTax

Dividend is paid if Cash above Reserve is sufficient

Excel Method:

Line 1: PLAfterTax

Line 2: SUM: sum of line 1

Line 3: BASE: line 2 minus past dividends

Line 4: max(line3-reserve,0)

Line 5: CFBefDiv

Line 6: CashAvailable: line 5 +line4(-1) – dividend(-1)

Line 7: Dividend: max(min(line4*divrate;line6);0)

DAM MODELING – WORKING CAPITAL

The following item are usually delayed

- Taxes
- Dividends

This creates a difference between Cash Flow Statement and Income Statement

This difference is covered with an additional Working Capital, in this case positive.

DAM MODELING – TERMINATION

Check the Balance Sheet at the end:

How to terminate the Project:

0 - Make sure the Balance Sheet is still balanced!

1 - Make sure all loans have been repaid

2 - Make sure all fixed assets have been amortized, if not, sell the asset at their book value – suppose taxes are the same

3 – Pay back all the retained profit if any to shareholders

4 – Pay back the equity

Or enter discount values of “permanent” flows

SIMULATIONS

1 – INPUT TABLE

use INDEX to link INPUT TABLE with input cells

line: scenario cell: CSCE

column: input number (in column B)

2 – OUTPUT TABLE

Copy of all output on first sheet

Link with INDEX function

3 – CALCULATION

Use single entry table with CSCE cell as entry cell

Return

Once modelling is done and the accounting tables balanced, it is possible to calculate RETURNS through 3 indicators:

- Sum of Flows/Numbers
- NPV
- IRR

IRR is not always possible, because it requires positive and negative numbers.

Return

1 – Operational Return

Use CashOP from Cash Flow Statement.

This includes:

- Revenues
- Costs and local taxes
- Working Capital
- Capex only

IRR should be positive.

This return can be adjusted with Corporate Taxes

Return

2 – Accounting Return

Use PLPROD in INCOME STATEMENT

This includes:

- Revenues
- Costs and local taxes
- Amortization

And add CAPEX in order to calculate a IRR

IRR should be positive

Return

3 – Project Return

Use CFBEFTAX in CASH FLOW STATEMENT

And exclude EQUITY line

This includes:

- Revenues
- Costs and local taxes
- Working Capital
- Debt Flows
- Interests received and paid

Return

4 – Project Accounting Return

Use PLBEFTAX in INCOME STATEMENT

And exclude EQUITY line

This includes:

- Revenues
- Costs and local taxes
- Amortization of Fixed Assets and Debt
- Interests received and paid

Return

5 – Economic Return

Use the Cash Flow Statement in order to get a complete list of records with a total sum of zero, while including the balance, ie the cash account.

In this way, the single line REVENUE can be split into many components

Use NPV on “volumes” to get a price per Unit, here KWH

Check the positive and negative lines

Can also be done while incorporating taxes in relevant lines.

8 – Performance and Ratios

Cost of Capital

The **cost of capital is the rate of return the suppliers of capital require as compensation for the use of their funds.**

It is used to evaluate new projects of a company as it is the minimum return that investors expect for providing capital to the company, thus setting a benchmark that a new project has to meet.

It is also the **opportunity cost** of fund as the cost of capital is the rate of return that capital could be expected to earn in an alternative investment of equivalent risk.

Cost of Capital

A company can raise capital by issuing equity, debt, preferred stock and other securities.

Each source has a separate required rate of return called component cost of capital. The marginal cost of capital (cost of each additional dollar of fund) is used to evaluate future investment projects.

The WACC weighted average cost of capital (WACC) is the weighted average of the required rates of return of all capital components. The weights are the proportion of the various sources of capital that the company uses.

By taking a weighted average, we can see how much interest the company has to pay for every dollar it finances.

Cost of Capital

The WACC equation is

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

With:
Re = cost of equity
Rd = cost of debt
E = market value of the firm's equity
D = market value of the firm's debt
V = E + D
E/V = percentage of financing that is equity
D/V = percentage of financing that is debt
T = corporate tax rate

Book Rate of Return

Annualized Simple indicators based on Financial Statements:

Annual Book Rate of Returns:

$$\text{Return} = \frac{average\_annual\_revenues}{initial\_investment}$$

$$\text{Return} = \frac{average\_annual\_revenues}{average\_investment}$$

Average Accounting Rate of Return (AAR):

$$\text{AAR} = \frac{average\_net\_income}{average\_book\_value}$$

Average Investment : (Book value at beginning of year 1+ book value at end of useful life) /2

The major drawbacks : it uses profit (accounting income)

rather than cashflows, and it does not account for the time value of money.

Economic Profit or EVA

Economic Value Added or **EVA** is an estimate of the project economic profit.

The value created in excess of the required return of the investors

$$EVA = EBIT\ (1\text{-}t) - WACC\ .\ Capital$$

EBIT: Earning before taxes and interest

T : Tax rate

WACC : Weighted average cost of capital

Capital : Investment amount

Equivalent Annual Cost

- In finance the **equivalent annual cost** (EAC) is the cost per year of owning and operating an asset over its entire lifespan.

- EAC is often used as a decision making tool in capital budgeting when comparing investment projects of unequal lifespans.

For example if project A has an expected lifetime of 5 years, and project B has an expected lifetime of 7 years

it would be improper to simply compare the net present values (NPVs) of the two projects, unless neither project could be repeated.

Equivalent Annual Cost

- EAC is calculated by dividing the NPV of a project by the *present value of an annuity* factor.

$$EAC = NPV.\frac{r}{1-(1+r)^{-n}}$$

- Equivalently, the NPV of the project may be multiplied by the *loan repayment factor*.

$$NPV = EAC.\frac{1-(1+r)^{-n}}{r}$$

The use of the EAC method implies that the project will be replaced by an identical project.

Equivalent Annual Cost

Comparison of 2 projects with different timing:

we suppose an identical replacement (no technological progress)

Keep as the comparison period, a common multiple of both projects

Example 1:

	Project A:	Project B:
Investment	y0: 30	y0 40
Revenues:	y1 - y4: 10	y1 -y6: 10
Redemption:	y4: 5	y6: 5

Example 2: light bulb

	normal	LED
Ini Cost	1000	3000
Cost/year	18000	12000
Duration	2	4

DURATION	5	7
Rate	10%	10%
NPV	5,11	6,37
EAC	1,3490	1,3095

DURATION	3	5
Rate	10%	10%
Cost NPV	-32 239,67	-41 038,39
EAC	-12964,05	-10825,82

After Tax

Tax rates can distort the decisions:

Tax on companies are relevant when the retained benefits are positive.

This is an extra cost in the project, but this cost is the same for all projects.

It is possible to calculate a return before and after taxes:

In general, we have: r(after) > r(before)/2

Tax effects:

on costs: decrease the cost: if cost increase, taxable revenue decrease

on depreciation: decrease the cost: if depreciation increase, taxable revenue decrease

on revenues: difference between before and after tax

Calculate NPV, before and after taxes

These calculations are dependant on the depreciation method

Amortization

Amortization Methods:

1 - Linear: Amount/number of years

2 - Degressive: select a factor >1 (ex α=2), first rate is α.(1/n) to be applied until the linear method on the remaining period gives a greater amortization

3 - American “sum of the years digits method”: total number is the triangular number applied to the number of years. Then, the first year takes n, the second year n-1 and so on.

Inflation

How to take into account inflation:

Previous WACC method were using nominal cash flows

Nominal cash flows should be discounted with nominal discount rate.

Real cash flows should be discounted with real discount rate

also:

Nominal=current currency

Real=constant currency

But with each method, one should get the same NPV!

EAC

Economic Price definition:

$$\text{UnitPrice} = \frac{Cost}{Volume}$$

Calculate the economic price, based on economic cash flows and estimated economic life span of equipment, instead of accounting costs and depreciation.

Calculate the discounted Price:

$$\text{Discounted\_Price} = \frac{d_0 + \frac{d_1}{1+i} + \frac{d_2}{(1+i)^2} + .. + \frac{d_n}{(1+i)^n}}{q_0 + \frac{q_1}{1+i} + \frac{q_2}{(1+i)^2} + .. + \frac{q_n}{(1+i)^n}}$$

with di: costs

and qi: quantities

Efficiency Ratios

Debtors Days = Trade debtors / Net sales x 365

Total Stocks Days = (Raw materials + Work in progress + Finished Goods) / Cost of goods sold x 365

Raw Materials Days = Raw materials / Cost of goods sold x 365

Work In Progress Days = Work in progress/ Cost of goods sold x 365

Finished Goods Days = Finished goods / Cost of goods sold x 365

Creditors Days = Trade creditors / Cost of goods sold x 365

Accruals Days = Accruals / Cost of goods sold x 365

Net Plant Turnover = Net sales / Net fixed assets

Working Investment/Sales = [(Trade debtors + stocks) - (Trade creditors + accruals)] / Net sales

Financial Ratios

Tangible Net Worth = Total net worth - Intangibles

Liquid Assets = Cash + Short term investments + Trade debtor + Other debtors

Working Capital = Total current assets - Total current liabilities

Current Ratio = Total current assets / Total current liabilities

Quick Ratio = (Liquid assets + prepayments) / Total current liabilities

Gearing = (Total loans + STDebt + OutstandingDebt) / Total net worth

Cash Flow Ratios

Debt Ratio = Total liabilities / Total Asset

Interest Cost = Interest / (LTOutstandingDebt +STDebitBalance)

Interest Cover = Operating profit / Interest expense

Financing Payments Cover =

Operating profit / (Interest expense + Debt + Dividends)

Total Debt Payout = Total interest - Bearing Debt / Operating profit

LT Debt Payout = Total interest - Bearing LTDebt / Operating profit

Cover Ratios – On each year

Debt Service Coverage Ratio

$$DSCR = \frac{CFADS}{DS}$$

CFADS : Cash Flow Available for Debt Service

DS : Debt Service = Principal Repayment+Interest

Cover Ratios – at a date

LOAN LIFE Cover Ratio

$$\text{LLCR} = \frac{NPV(CFADS\ over\ Loan\ Life)}{Debt\ Balance}$$

CFADS : Cash Flow Available for Debt Service

Debt Balance : Outstanding Loan Value

Cover Ratios – at a date

PROJECT LIFE Cover Ratio

$$\text{PLCR} = \frac{NPV(CFADS\ over\ Project\ Life)}{Debt\ Balance}$$

CFADS : Cash Flow Available for Debt Service

Debt Balance : Outstanding Loan Value

Operating Cash Flows

Operating Cash Flows:

With S: incremental Sales

C: incremental expenses

DEPR: depreciation

EBITDA: S-C

EBIT: S-C-DEPR

$$CF_0 = (S - C - DEPR)(1 - tax) + DEPR$$

$$CF_0 = (S - C)(1 - tax) + DEPR.tax$$

$$CF_0 = EBITDA(1 - tax) + DEPR$$

$$CF_0 = EBIT(1 - tax) + DEPR$$

Termination Period

Replacement: Terminal Year: T (non operational)

With: WC: Recovery of Working Capital
SalvN: Salvage Value of old equipment
BVN: Book Value of old equipment
tax: Tax Rate

$$T_N = WC + Salv_N - (Salv_N - BV_N).tax$$

Mini Case Study

Construction 1Y, Operation 10Y

Investment: 15 M+ 5 M over 10 years

Depreciation: linear over 10 years

Initial additional cost: 1M

Revenues – costs: 15% each year during 10 years

Corporate Tax: 40%

Termination year = last year of production

Termination cost: 0,5M

Selling residual asset: 5M

Mini Case Study

Solution with formulas:

Construction phase:

-inv-wc-cost(1-t)

-(55+5)-3-1.(60%)=-63.6

Operation phase

(rev-cost)(1-t)+dep.(t)

(rev-cost)-(rev-cost-dep).t

15.60%+6.40%=9+2.4=11.4

Termination phase

-cost(1-t)+sell-(sell-res).t+wc

-cost(1-t)+sell(1-t)+wc = -0.5.60%+5.60%+3=5.7

9 - Project Finance Risks

Risk

Now we can introduce the concept of RISK

Financial Risk is related to a random variable so with **uncertainty** in the future:

- the variable is well defined
- the variable is measurable
- the variable is related to money

Corporate Risk

Uncertainty today – lack of information

In contracts, RISK PROFILE is the best way to SEE risks.

Risk Definition

MARKET RISK

Risk of loss due to market price movements

CREDIT RISK

Risk of loss due to counterparty default

LIQUIDITY RISK

Risk for the Bank not to find the underlying at maturity date

OPERATIONAL RISK

Risk from all other factors

Risk Definition

SUMMARY

ACTOR	LENDER	BORROWER	BUYER	SELLER
CREDIT RISK	YES			
MARKET RISK			YES	YES
LIQUIDITY RISK				YES

Risk Analysis and Mitigants

1. Political & Legal Environment
2. Financial Strength
3. Market Risk
4. Operations
5. Pre-Completion

1. Political & Legal Environment

RISK DRIVERS

1. **Regulatory – Legal System :** stable?
2. **Country Rating:** rating?
3. **Enforceability of Contract :** how enforceable?
4. **Force Majeure** *: susceptibility?*
5. **Concession Structure** *(Infrastructure)* *: accepted?*

MITIGANTS

1. **Sponsor:** track record?
2. **Government Support :** explicit or implicit?
3. **Insurance PRI** *: in place?*
4. **Importance of project to host country** *: backed?*
5. **Legal and Tax Opinions** *: backed?*

2. Financial Strength

RISK DRIVERS

1. **Debt Service Cover Ratio (DSCR)**
2. **Sensitivity Robustness (stress-base)**
3. **Loan Life Cover Ratio (LLCR)**
4. **EBITDA / net interest**
5. **Net Debt / EBITDA**
6. **Amortisation Schedule:** full, balloon, bullet?
7. **Facility Tenor vs Duration of the asset/Economic life**
8. **Equity / Total Investment or Project Cost**
9. **Loan-to-value**

MITIGANTS

1. **Covenants, Dividend Limitations:** strong and extensive?
2. **Reserve Account:** period covered and funding?
3. **Hedges:** 40-70% financial risk hedged
4. **Sponsor Commitment:** strong commitment?
5. **Cashsweeps:** in place?

2. Financial Strength

RISK DRIVERS

AVERAGE	INFRASTRUCTURE	POWER	NR O&G INDUSTRIAL
DSCR	1.15 - 1.5	PPA 1.2 - 1.3	1.2 - 1.8
LLCF	1.2 - 1.4	PPA 1.2 - 1.5	1.2 - 1.8
DEBT RATIO	90 - 75 %	PPA 90 - 75%	80 - 60%
PPA			

3. Market

RISK DRIVERS

1. **Volatility of Demand:** stable?
2. **Market Outlook:** growing?
3. **Competitive Advantage:** strong/medium/weak?
4. **Volatility of Sales Price** (NR O&G): stable?
5. **Volatility of Supply Price/ Volume:** stable?
6. **Entry Barriers:** high?
7. **Type of Commodity:** region/ liquidity?
8. **Volatility of Unit Gross Margin :** stable?

MITIGANTS

1. **Off Take Contract / Quality Purchaser:** strength & term?
2. **Sponsor:** track record? Financial standing?
3. **Strategic Importance of the Asset:** importance?
4. **Deferrals** (O&G): in place?
5. **Marketing Capability:** avg. at least 50% output sold
6. **Supply Contracts:** term & financial strength?

4. Operations

RISK DRIVERS

1. **O & M Operators:** track record? Dependency?
2. **Required Performance:** availability?
3. **O & M Contracts:** strength? Term?
4. **Maintenance Outages:** difficult? Predictable?
5. **Technology / Experience:** track record? Cost? Predictions & assumptions used?

MITIGANTS

1. **Insurance:** business interruption & casualty policy?
2. **Monitoring Quality / Possibilities:** who & how many performed?
3. **Sponsor:** track record? Financial standing?
4. **Penalties / Bonus / Incentive:** strong system?
5. **Reserve Account:** period covered? Level of funding?

5. Pre – Completion

RISK DRIVERS

1. **Complexity of Design:** easy/proven?
2. **Technology:** proven?
3. **Contractor:** track record? Financial strength?
4. **Licenses & Procurement:** obtained?
5. **Site Risk :** significant?
6. **Budget & Schedule Adequacy:** conservative? Adequate contingency lines? Provision for unexpected events?
7. **Size of Project:** small/medium/large?

MITIGANTS

1. **Sponsor:** track record? Financial strength?
2. **Contract Type:** fixed price? Date certain? turn key?
3. **Guarantees, Penalties:** strong enough to assure add cash?
4. **Contingent Equity Clause:** in place? Adequate?
5. **Construction Monitoring :** enough insight?
6. **Liquidated Damages:** in place, level ?
7. **Pre Completion Support:** strong ?
8. **Cost overrun Facility/ Contingency:** in place? Adequate?
9. **Financial Support**: completion guarantee?

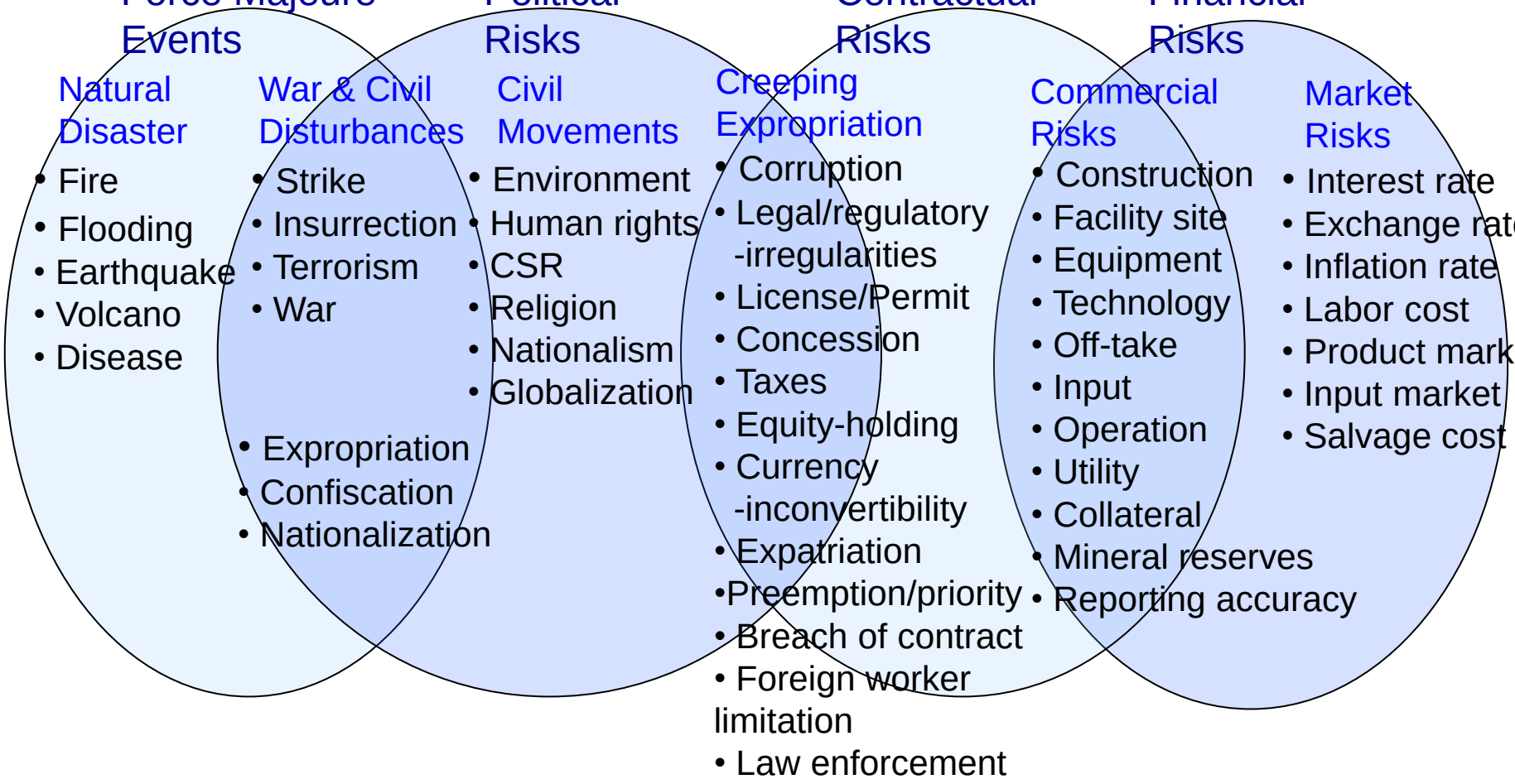
Alternative Approach to Risk Mitigation

Risk	Solution
Completion Risk	Contractual guarantees from manufacturer, selecting vendors of repute.
Price Risk	hedging
Resource Risk	Keeping adequate cushion in assessment.
Operating Risk	Making provisions, insurance.
Environmental Risk	Insurance
Technology Risk	Expert evaluation and retention accounts.

Alternative Approach to Risk Mitigation

Political and Sovereign Risk	• Externalizing the project company by forming it abroad or using external law or jurisdiction • External accounts for proceeds • Political risk insurance (Expensive) • Export Credit Guarantees • Contractual sharing of political risk between lenders and external project sponsors • Government or regulatory undertaking to cover policies on taxes, royalties, prices, monopolies, etc • External guarantees or quasi guarantees
Interest Rate Risk	Swaps and Hedging
Insolvency Risk	Credit Strength of Sponsor, Competence of management, good corporate governance
Currency Risk	Hedging

Project Finance Credit Risks Overview



Project Risks allocation

What may be an unacceptable risk for one party may be perfectly acceptable to another

Risk Allocation Grid	Lenders	Offtaker	Contractor	Operator	Shareholders	Insurance
Reservoir Risk						
Annual Production						
Volume & Sales						
Price index risk						
Expropriation						
Construction delays						
Contractor risk						
Shareholder breach						
Permitting						
Cost overruns						
Transfer risk						
Change in law / tax						
Force majeure						
Uninsurable events						
Operator performance						

10 - Project Contract

1 - The Project Agreement

1.1 Offtake Contract
1.2 Concession Agreement
1.3 Term of Project Amount
1.4 Control of Project Design and Construction, Contracts and Financing
1.5 Compensation for Additional Costs
1.6 Force Majeure
1.7 Step in by the Offtaker or Contracting Authority
1.8 Termination of the Project Agreement
1.9 Effect of Debt Refinancing or Equity Resale on the Project Agreement

2 - Ancillary Contracts

2.1 EPC Contract – Engineering Procurement Construction
2.2 Operation and Maintenance Contracts
2.3 Fuel or Other Input Supply Contract
2.4 Permits and Other Rights
2.5 Government Support Agreement
2.6 Insurance
2.7 Direct Agreements

1. The Project Agreement

- **Project Contracts** provide a basis for the Project Company's construction and operation of the project

- The **Project Agreement** is the most important of the project contracts

- There are two **main models** for a Project Agreement:
  - **Offtake Contract**
  - **Concession Agreement**

1.1 Offtake Contract

Offtake contract is used for a project that produces a product

- Offtake contract **provides** the Offtaker (purchaser) with a secure supply of the required product and the Project Company with the ability to sell its products on a pre-agreed basis
- Offtake Contracts can take **various forms**:
  - Take or pay contract
  - Take and pay contract
  - Long Term sales contract
  - Hedging contract
  - Contract for Differences
  - Throughput contract
- **Power Purchase Agreement** PPA is the most common type of Offtake Contract in project finance and other contracts tend to follow the PPA model

1.2 Concession Agreement

A **Concession Agreement** (Service Agreement or Project Agreement) is a contract between a public sector entity and the Project Company, under which a project is constructed to provide a service rather than a product to the public sector entity or directly to the public

- It has many **characteristics in common** with an Offtake Agreement

Examples of Concession Agreements:

- A toll road, bridge or tunnel for which the public pays tolls
- A transportation system for which the public pays fares
- Water and sewage systems for availability of the system

1.2 Concession Agreement

- Concession Agreements can be divided into **two classes**:
  - Service Contracts
  - Toll Contracts

- **Service Contracts** is an agreement under which a service is provided to a Contracting Authority but where usage risk remains with the Contracting Authority. Payments are made for the availability of the project.

- **Toll Contracts** is a long established contractual structure giving a right to collect tolls or fares from the general public

1.3 Term of Project Agreement

- **The term or duration of a Project Agreement** is normally **measured from the Commercial Operation Date COD**, subject to a back stop date

- Alternatively the Project Agreement may run for a **fixed period** from signature of the Project Agreement

- Various **factors** influence the length of the term:
  - The useful life of the project
  - The likely term of the debt
  - The residual value of the plant

1.4 Control of Project Design and Construction, Contracts and Financing

- The **Project Company** is fully responsible for designing the project to meet the required performance specifications and arranging construction to meet the required completion schedule
- The **Offtaker or Contracting Authority (CA)** must specify the product or service required in sufficient detail to ensure what is required is delivered
- The **way in which it is delivered** is primarily the Project Company's responsibility
- The Offtaker or CA has **no right to require** changes in design, to supervise or otherwise get involved in the construction process
- Not unreasonable for the Offtake or CA to **have the right** to review designs, visit the site and be kept informed on progress due to its experience

1.5 Compensation for Additional Costs

- The **Availability or Unitary Charge may also be adjusted** under the Project Agreement to compensate the Project Company for **additional costs** in other limited circumstances or **a compensation payment** may be made instead of changing the Availability or Unitary charge.

- This occurs when:
  - Breach by the Offtaker or Contracting Authority
  - Change in specifications
  - Changes in law
  - Latent defects

1.6 Force Majeure

- A **force majeure** event is something that affects the ability of one party to fulfil its contract but which is not the fault of and could not reasonably nave been foreseen by that party.

- **The results** of force majeure are
  - A party subject to force majeure should not be penalised for non performance as a result of this
  - If the product or service is not being delivered because of force majeure, no payments are due from the Offtaker or Contracting Authority
  - A party subject to force majeure remains liable to make any monetary payments due under the contract
  - If force majeure makes it permanently impossible for the contract to be carried out it is cancelled

1.6 Force Majeure

- Force majeure events can be divided into **two main classes**:
  - **Natural Force Majeure**
  - **Political Force Majeure**

Examples of **Other events**:

- Unforeseen ground conditions during construction
- Delay in obtaining permits or licenses
- Sabotage

- **Relief events** are temporary force majeure events that prevent the completion of construction of the project
- Force majeure that makes it **permanently impossible to complete** or operate the project is dealt with under the termination provisions discussion

1.7 Step in by the Offtaker or Contracting Authority

- As an **interim measure** of default by the Project Company, the Offtaker or Contracting Authority may also have the right to step in and operate the project itself to ensure continuity of supply or service
- They may also have this right in the **case of an emergency**, even if the Project Company is not in default
- The **tariff** continues to be payable if the Offtaker or CA operates the plant
- Both **investors and lenders** will be uneasy about the terms on which such a step in right can be allowed and it has to be coordinated with the lenders' step in rights.

1.8 Termination of the Project Agreement

- The Project Agreement **may be terminated** before the end of its normal term because of
  - Default by the Project Company
  - Default by the Offtaker or Contracting Authority
  - Force majeure event
  - Offtaker or Contracting Authority also have the option to terminate the Project Agreement early and take over
- **Negotiating** what happens after a early termination is difficult: key issue is whether a compensation payment should be made by the Offtaker or Contracting Authority and how should it be calculated
- **Negotiations** on this issue often becomes a dialogue between the lenders and Offtaker or Contracting Authority, with the Sponsors on the side line
- **Short term failure** to perform to the required standard can generally be dealt with by penalties' rather than termination

1.8 Termination of the Project Agreement

- **Events** may include:
  - Project completion does not take place by an agreed backstop date
  - Failure to develop the project or to be available for operation for prolonged periods of time
  - Operating performance cannot meet minimum required standards
- The **most common options** to deal first with termination after the project has started operating are:
  - A Termination sum payment based on outstanding equity and debt, less costs to the Offtaker or CA of remedying the default
  - A Termination Sum payment equal to the outstanding debt
  - Sale of the project with its Project Agreement in the open market
  - No payment at all

1.9 Effect of Debt Refinancing or Equity Resale on the Project Agreement

DEBT REFINANCING

- **Refinancing the debt** once the project has been completed is a common phenomenon in project finance. It can take various forms:
  - Increasing the debt amount
  - Extending the debt repayment term
  - Reducing the interest costs
  - Otherwise improving loan terms
- Refinancing may also be necessary because the **project has got into trouble.** This raises some issues for the Offtaker or CA:
  - Performance may be affected if the Sponsors recover most of their original investment via the refinancing and so have a limited continuing financial interest in the success of the project
  - A refinancing may increase the amount payable as a Termination Sum following default by the Project Company or a force majeure event if this is calculated including debt outstanding

1.9 Effect of Debt Refinancing or Equity Resale on the Project Agreement

- The Offtaker or CA may therefore **wish to exercise some control** over a refinancing or forbid it
- The Offtaker or CA may wish to claim a share of the windfall gain for the investors

EQUITY

- The Sponsors may want to take the opportunity early in the project's operating life to sell some of their equity at a premium
- Again the Offtaker or CA may wish to claim a share of the windfall gain

2.1 EPC Contract

- **Construction contract** in a project financed project is usually in the form of a contract to design and engineer the project, procure or manufacture any plant or equipment required and construct and erect the project

- This is know as the **Engineering, Procurement and Construction EPC contract**

- The EPC contract provides for the work to be done by the **EPC Contractor** at a fixed price and to be completed by a fixed date

- Also known as a **Turnkey Construction Contract**

2.1 EPC Contract

Key aspects of an EPC contract from the project finance point of view are:

- Contract scope
- Commencement of the works
- The Project Company's responsibilities and risks
- Contract price, payments and variations
- Construction supervision
- Definition of completion
- Force majeure
- Liquidated damages
- Suspension and termination
- Dispute resolution

2.2 Operation and Maintenance Contracts

- An **O&M contract** helps to ensure that project O & M costs stay within budget and that the project operates as projected
- O&M may be dealt with under **one contract** with a single contractor or **responsibilities may be split**
- Another approach is for the **EPC Contractor or Equipment Supplier** to provide long term major maintenance, while minor maintenance are undertaken by an O&M contractor
- The O&M contract has to **clearly define** the:
  - Scope of the Contract
  - Services
  - Fee Basis
  - Incentives and Penalties
- In some cases the **manufacturer** may be willing to assume responsibility for performance and maintenance of major elements of the project against payment of fixed maintenance fees over a period of time

2.3 Fuel or Other Input Supply Contract

- **Fuel and raw materials** are likely to be the main operating costs for a project selling an output product
- **Security** of the input supplies, on an **appropriate pricing basis**, is therefore an important building block for this type of project finance usually achieved through a long term Input Supply Contract
- The **Input Supply Contract** usually matches the general terms of the Offtake Contract
- In the **absence of an Offtake Contract** , the Input Supply Contract should run for at least the term of the debt
- An Input Supply Contract for the Project Company is an Offtake Contract for the Input Supplier and therefore may share many of the characteristics of an Offtake Contract
- The Input Supply Contract **sets out** the :
  - **Supply basis**
  - **Pricing basis**
  - **Physical delivery risks**
  - **Force majeure**

2.4 Permits and Other Rights

- The **permits and other rights** required for construction and operation of the project are not separate contracts, but obtaining or providing for these is usually both a key condition precedent to the effectiveness of the Project Contracts and to Financial Close
- **Permits** divide into **two main categories**:
  - Those required for construction and operation of the project
  - Those required for investment in and financing of the Project Company
- **Rights of way or easements** may be required and agreements may be required to use common facilities with another party
- The first stage in obtaining both construction and operating Permits is to prepare an **Environmental Impact Assessment (EIA)**
- **Specific Permits for investment in or financing** of the Project Company are unlikely to be required in developed countries, but in developing countries **investment and exchange controls** are likely to be applied to the Project Company

2.5 Government Support Agreement

- **The purpose** is to facilitate the completion and operation of the project by providing government support for any aspect of the project where the parties agree this is required
- It is usually **supplementary to an Offtake Contract**
- In many projects there is **no need for a Government Support Agreement**, the general law of the country sets up the framework
- The **scope** of a Government Support Agreement varies according to the particular project, some provisions may include:
  - The Agreement sets the general framework and gives permission for construction and operation on an exclusive basis
  - Guarantees are given of non-discrimination against the project
  - The Sponsors may be required to retain their shareholdings for specified periods
- A contract of this type may be highly political

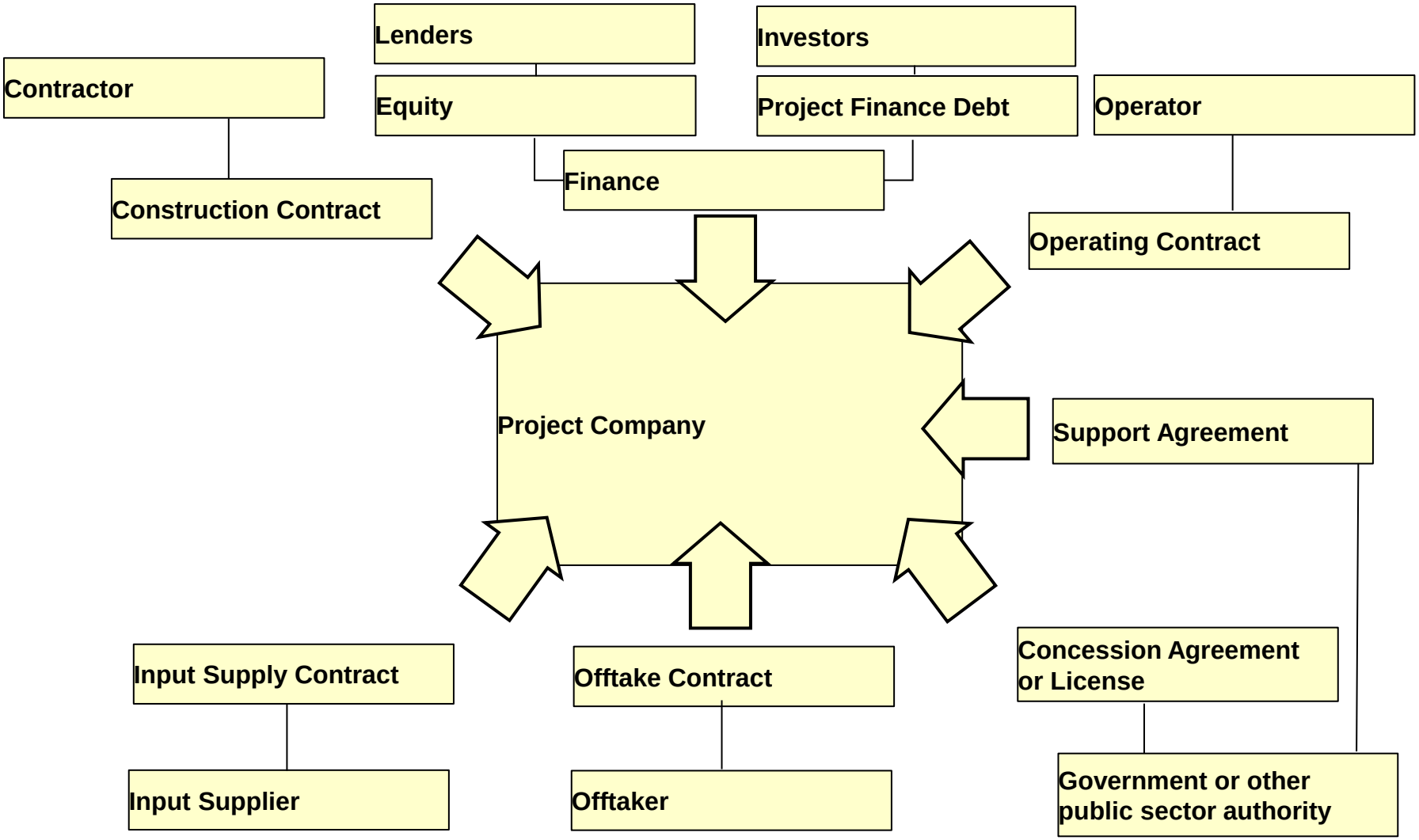
2.6 Insurance

- **Insurance requirements** in project finance are demanding and as a result insurance costs are high
- The Sponsors need to **appoint an insurance broker** with specific experience both in insurance for project finance in general and in insuring major projects in the country concerned
- Insurance is arranged in **two phases:**
  - The insurance covering the whole of the construction period of the project
  - Annual renewal of insurances when the project is in operation
- **Normal insurances** required by law have to be taken out by the Project Company or the EPC contractor as appropriate

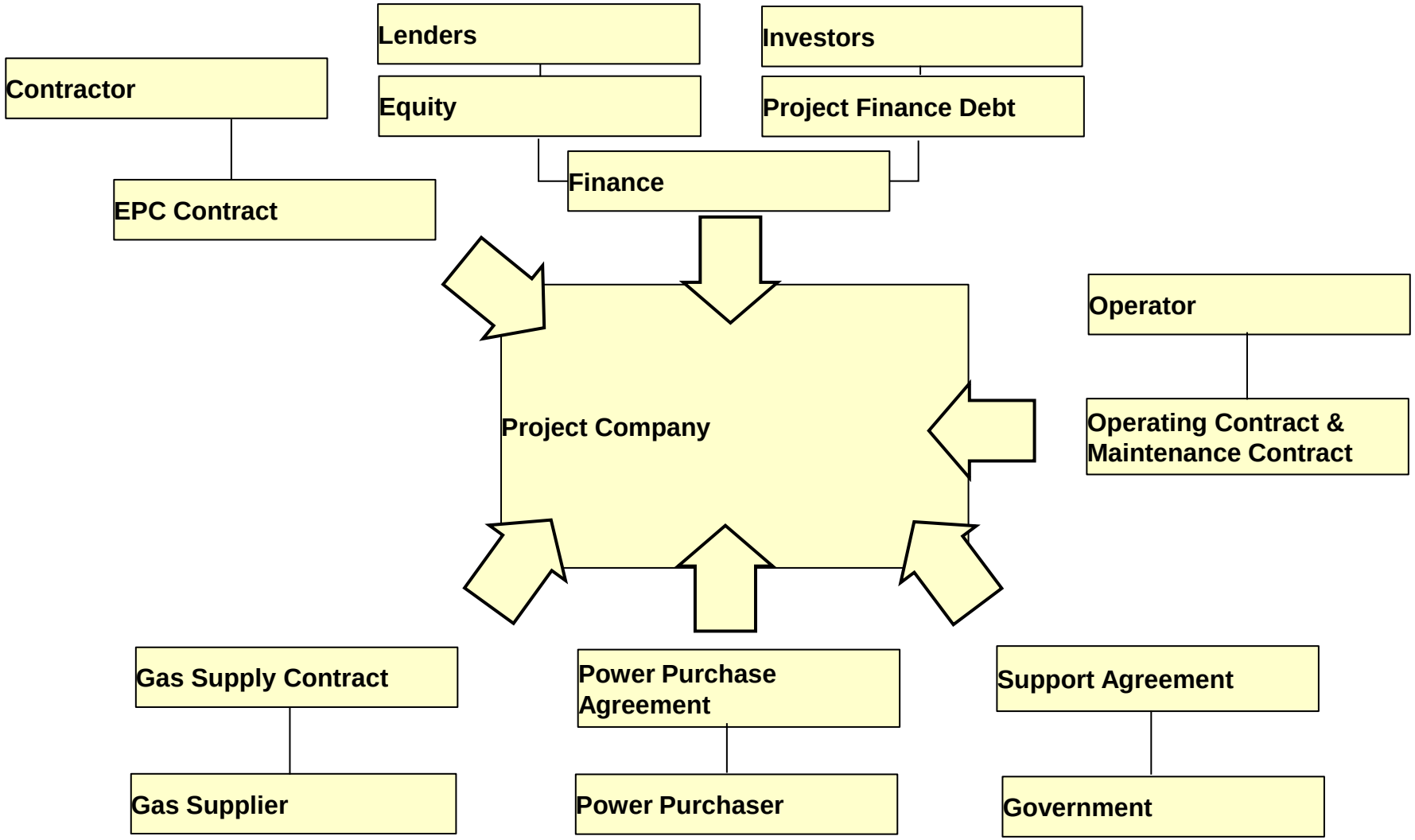
2.7 Direct Agreements

- EPC Contractor, O&M Contractor, Offtaker or Contracting Authority, Input Supplier, Host Government and other key Project Contract counterparties are all normally required to **sign Direct Agreements with the lenders**
- They are also known as **acknowledgments and consents**
- They are usually **negotiated at the same** time as the Project Contracts and the form of Direct Agreement is set out as an annex to the relevant Project Contract
- Under these Direct Agreements:
  - The lenders' security interests in the underlying Project Contracts are achknowledged
  - If the Project Contract counterpart is making payments, these are to be made to specific bank accounts or as notified by the lenders
  - Etc
- Direct Agreements may help lenders to **step rapidly** into the picture after the Project Company default to preserve these contract and find another part to take them over.

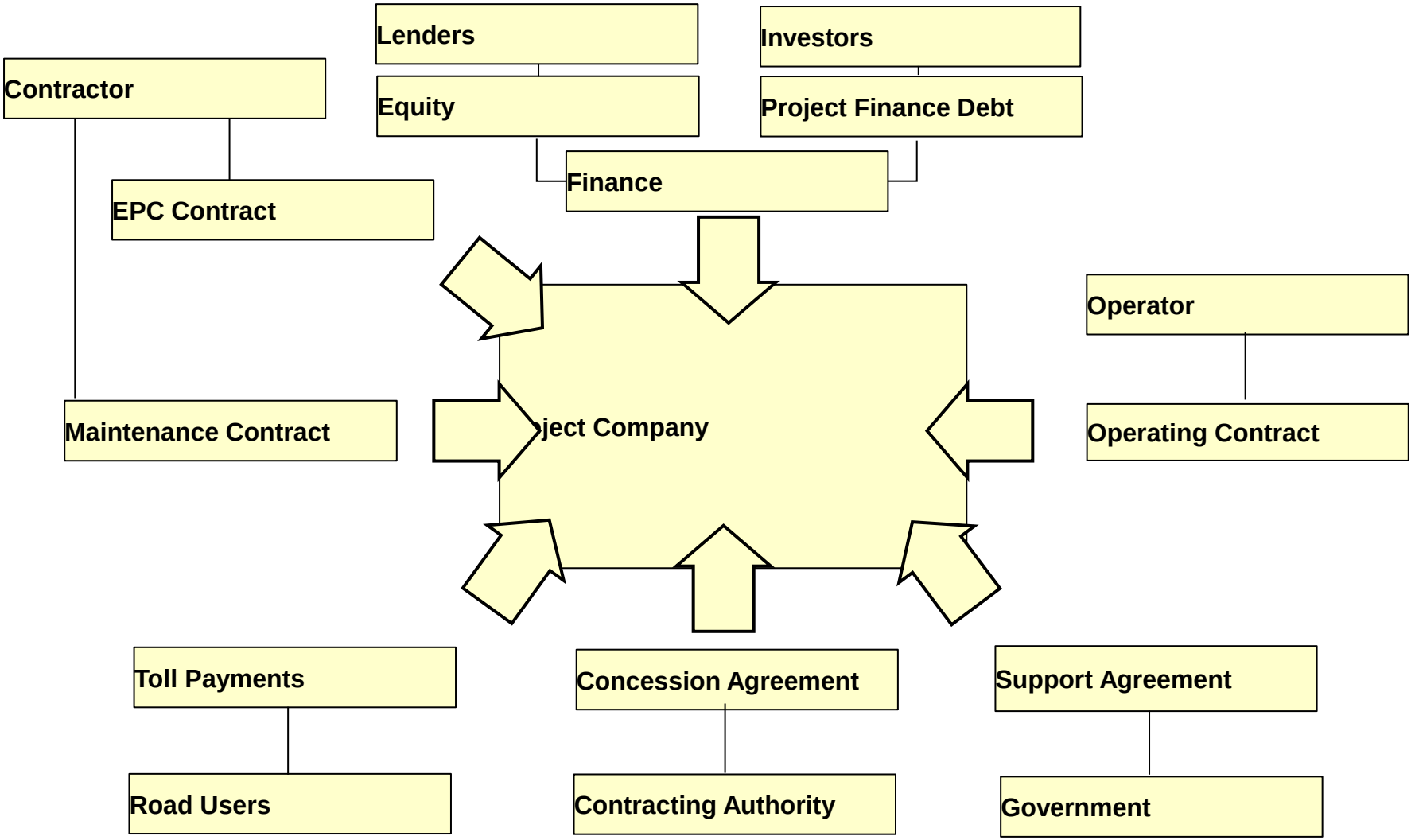
Annex A: Simplified Project Finance Structure



Annex B: Independent Power Project Finance Structure



Annex C: Toll Road Project Finance Structure



11 - Project Term Sheet

Financing Negotiations – term sheet

Main Elements In Financing Negotiations
(first in term sheet)

1. The Debt: Equity Ratio
2. The Term of the Debt and its Repayment Schedule
3. The Drawdown Schedule for Debt and Equity
4. The Interest Rate and Fees to be charged by Lenders
5. Lenders' control of the Project Company's Cash Flow
6. Provisions for Repayment
7. Lenders' Security
8. Conditions Precedent to Financial Close and Drawings on the Debt
9. Representations and Warranties to be given by the Project Company
10. Covenants or Undertakings by the Project Company
11. Events of Default
12. Voting and Enforcement on Default
13. Intercreditor Arrangements
14. Market disruption
15. Material Adverse Change

1. Debt:Equity Ratio

- **Leverage** is the essence of project finance
- Sponsors wish to **limit the amount of equity** they invest in a project to improve own return
- Amount of **equity required** is the difference between the maximum level of debt a project can raise and project costs
- Two factors determine the **level of debt**:
  - Lender's cash flow cover requirements – DSCRs, LLCR, PLCR (affected by the certainty of the cash flow)
  - Lender's view on leverage
- Generally, lenders wish Sponsors to be at risk with a **reasonable amount of equity in the project**
- Project Finance Company is normally required to demonstrate that is has met the **required debt:equity ratio** at the later of COD
- **Debt: Equity calculation** is based on the cash injections of debt and equity, not whatever appears on the balance sheet
- If **more than one currency** is used for funding, the calculation should be based on the exchange rate between these currencies at Financial Close

2. Debt Service

- **Debt Service** includes loan interest payments and principal repayments
- Debt Service is one of the biggest factors that influences an **investor's rate of return**
- **Conflicting demands** of Investors (dividends) and Lenders (debt repayments)
- **Issues regarding the debt repayment schedule**:
  - **The term of financing**: depends on long term certainty of the cash flow of the project, debt service schedule and location of project
  - **The Average Life:** average number of years (or shorter periods) that the principal is outstanding. This is calculated by taking the loan principal outstanding from each year, adding these together and dividing by the original loan amount.
  - **The Repayment Profile:** usually begin around 6 months after construction of the project is complete and are usually made at 6 monthly intervals. Repayment structure can be in equal instalments, in annuities or irregular. The debt repayment structure affects the cost of the Project Company's products or services.
  - **Flexibility in Repayment:** to avoid default if a temporary cash flow problem occurs.

3. Interest Rate and Fees

- Apart from the **lenders advisors' fees**, the main **financing costs** payable by the Project Company are:
  - If the loan is on a floating interest rate basis, the **base interest rate plus the interest margin, together with net payments under an interest rate swap**
  - If the loan is on a fixed rate basis, **the interest rate**
  - **Advisory, arranging and underwriting fees**
  - **Commitment fees**
  - **Agency and security trustee fees**
- International project finance loans at a floating rate based on LIBOR typically have **interest margins of x bp over LIBOR**
- **Pricing is usually higher until completion of construction (unless there is a completion guarantee)**, reflecting the higher risk of the stage of the project, then drops down and gradually climbs back again

3. Interest Rate and Fees

- Commercial bank lenders also require **standard market disruption and increased costs provisions** in their long term floating rate loans
- **Arranging and underwriting fees** charged by bank Lead Managers are derived from
  - The size and the complexity of the financing
  - The time and work involved in structuring the financing
  - The risk that a success based fee may not be earned because of the project does not go ahead
  - The bank's overall return targets for work of this kind, taking into account both the fees earned and the return on the loan balance that it keeps on its own books
  - The length of time the underwriting bank has to carry the syndication risk
  - The proportion of the fee that has to be reallowed to subunderwriting or participating banks to induce them to join the syndication .
  - The **overall level of fees may vary between [ ] %** of the loan amount with the level of arranging and underwriting fee at about the same % as the interest margin

3. Interest Rate and Fees (continued)

Commitment fees are paid on the available but undrawn portion of the debt during the construction period

In **project finance loans commitment fees** are usually between [ ] p.a to half the interest margin.

The **annual agency fees** has to cover the agency work adequately but the fee should be based on a fair assessment of costs, not a major source of extra profit for the agent.

4. Drawdown of Debt and Equity

Priority of Drawing: what should be spent first debt or equity? The later the money is invested, the higher the IRR.

The only **disadvantage of not contributing the equity before debt** is that project costs are increased because of the need to fund IDC.

Equity can be guaranteed by standby LC

is is normally provided as additional equity and debt.

4. Drawdown of Debt and Equity

The **procedure of drawing** on the loan usually involves the Project Company presenting a **formal drawing request**, which:

- Attaches a payment request from the EPC Contractor, certified by the Lenders' Engineer
- Summarises the purpose for which other funds are required
- Sets out how these costs are to be funded
- If tied funding from ECAs or other sources, provides the certification on the origins of the equipment or services required for this
- Compares the monthly and cumulative project costs with the construction budget
- Demonstrates that enough funds remain available to complete the project
- Demonstrates compliance with any other conditions precedent to drawings

4. Drawdown of Debt and Equity

Both equity investment and loan drawings are paid into a **Disbursement Account** in the Project Company's name over which the lenders have a security interest

- **Lenders may** control all the payments from the Disbursement Account or only take control if there is a default
- The Project Company needs to have **contingency funding** available to cover any unexpected extra project costs during the construction period. This is normally provided as additional equity and debt.

5. Control of Cashflow

During the operating period, the lenders normally **control the application of the cash flow** of the project by controlling the way which the cash is used. These **controls include**:

- An order of priorities in applying cash, known as cascade
- Requirements for the Project Company to establish reserve (or escrow) accounts
- Control on distributions of cash to investors
- In some cases, cash sweep or cash clawback requirements

5. Control of Cashflow

The controls for application of cash earned by the Project Company from its revenues are set out in a **cash flow cascade** setting out the order of priorities for the use of this cash. A typical **order of priorities** is

- Payment of fuel or raw material and operating costs, including the O&M Contract and taxes
- Fees and expenses due to the agent bank, security trustee etc
- Interest on the debt and any swap or other hedging payments
- Debt repayments
- Payments to the Debt Service Reserve Account and other Reserve Accounts
- Distributions to investors
- Cash sweep, if any

5. Control of Cashflow

Revenues can flow into the cascade in 2 ways:

- Lenders may require the Project Company to **segregate funds** for the first category of costs in a separate Operating Account under the Project Company's day to day control, leaving the other funds in a Revenue Account under the joint control of the agent bank or security trustee and the Project Company
- Alternatively, **all revenues may flow into one account**, from which the cascade payments are made by the Project Company and generally more practical for day to day operations.

Cascade arrangement is largely dormant during the **construction of the project**.

5. Control of Cashflow (continued)

- Lenders require the Project Company to establish **separate Reserve Accounts** (escrow or control accounts)
- Although they are in the Project Company's name, withdrawal requires the **consent of the agent bank** and the balances in these accounts form part of the lenders' security
- The Reserve Accounts **provide security** against short term cash flow problems
- Standard Reserve Accounts:
  - Debt Service Reserve Account (DSRA)
  - Debt Payment Reserve Account
  - Maintenance Reserve Account
  - Tax and other smoothing Reserve Accounts
  - Insurance Proceeds Account
  - Reserve Accounts and Cover Ratio Calculations

5. Control of Cashflow (continued)

- The **investors** come at the **bottom of the cash flow cascade**; once operating costs and all lenders' repayment and Reserve Account requirements have been met.
- The Project Company has to demonstrate that **sufficient cash** will remain or be generated in the future to repay debt after the distributions have been made. This dealt with by establishing dividend stop or lock up ratios.
- In some project a **cash sweep** may apply. This is usually used if there are likely to be substantial fluctuations in cash flow and lenders wish to ensure that some of the surplus cash generated in good times is used to reduce debt and provide a buffer against a downturn
- Under a **Cash clawback** undertaking, Sponsors agree that if the possible future cash flow problem develop, they will repay or lend to the Project Company up to the amount they have received in dividends or other distributions over a set period of time.

6. Debt Prepayments and Refinancing

- **Cash sweep** is a form of mandatory prepayment of the loan by the Project Company
- **Other mandatory prepayments** are normally required:
  - If the Project Company realises cash from the sale of assets
  - If performance LDs are received from the EPC Contractor
  - If insurance proceeds are not applied to the restoration of the project
- Mandatory prepayments are required if it becomes **illegal for the lenders** to continue with it
- The Project Company may also wish to reduce or prepay part or all of the loan **voluntarily**:
  - the total funding raised may not all be needed
  - Cash distribution restrictions imposed by the lenders or for other reasons may make it cost effective to repay
  - The project Company may wish to prepay the whole loan and refinance it on more attractive terms elsewhere

6. Debt Prepayments and Refinancing

- The Project Company may save commitment fees by **reducing the committed amount of debt**, perhaps also reducing its investors risk by reducing the committed equity pro rata
- **Lenders should not object** to this if there are sufficient funds to complete the project scheduled, with an adequate remaining safety margin.
- Bank lenders **should normally accept prepayment** of part of the loan once the project is in operation: except with a public sector lender
- Breakage costs need to covered
- Partial repayment is not normally allowed in bond issues
- Main question against which future loan payment instalments should the repayment be applied?
- Partial prepayments depend on the circumstances in which they are made

6. Debt Prepayments and Refinancing (continued)

- **Prepayment of the whole loan** to allow for a refinancing is very common in Project Finance.
- The Project Company should consider a **strategy for refinancing** before the original loan is signed
- Bank lenders may require a **refinancing fee** if it occurs during construction and perhaps in the first year or two of operation
- **Bond investors** as opposed to bank lenders are not flexible on prepayment

7. Security

- **Security over the project** as a whole is important:
  - to ensure the lenders are involved at an early stage if the project begins to go wrong
  - To ensure that third parties do not gain any prior or *pari passu* rights over the project assets
  - To ensure that project assets are not disposed of without the lenders' agreement
  - Generally to enable the lenders to encourage cooperation by the Project Company if it gets into trouble
- The lenders' security normally has **four layers**:
  - Control of cash flow
  - The ability to step in to the project under Direct Agreements (see contract agreements)
  - Mortgages and assignments of the Project Company's assets and contracts
  - Security over the Project Company's shares

7. Security

- **Mortgage and assignments of assets and contracts** includes:
  - Mortgages or charges over the project site, buildings and equipment
  - Assignment of Project Contracts and any bonds or guarantees for these contracts
  - Assignment of Permits and licenses
  - Charges over project bank accounts
  - Undertaking by the Offtaker or Contracting Authority to pay only to the Reserve Account
  - Assignment of insurance policies
  - Assignment of the Project Company's right to receive payments of equity from the Sponsors

7. Security (continued)

- Problems which may arise if **third party cooperation is needed** to create or make this security effective:
  - Consent to assignments by the other parties to Project Contracts may not be forthcoming
  - It may not be possible to assign Permits or licenses as security; some countries may not allow some types of Permits or licenses to be assigned because they are granted to a specific permit or license holder

7. Security (continued)

Since the Project Company's assets are in the Host Country, the security over them usually has to be governed by local law and jurisdiction. In developed countries this approach does not normally cause any difficulties. However some developing countries the lenders may **not be able to achieve an ideal security position**:

- the local law might prevent foreigners from owing land and so the lenders cannot take over the Project Company's rights in this respect
- High levels of stamp duty or ad valorem takes may be charged on registration of lenders' loans or security
- There may be preferential creditors that rank ahead of lenders' security
- Lenders may only be able to register their security for a fixed amount, leaving a risk that the total amount payable on default may be higher when interest, breakage costs and enforcement costs are included
- Lenders may only be able to register security in the local currency, (depreciation risk)
- The procedures for enforcing security may be too cumbersome for lenders
- Exchange controls may hinder lenders from removing enforcement proceeds from the country
- **If lenders cannot be granted a security over project assets the Project Company must give a negative pledge undertaking.**

7. Security (continued)

- **Security over Project Company shares :**
  - Enable lenders to step in more quickly than action under mortgage and contract assignments
- There may be some **difficulties** with lenders taking security over the Sponsors' shares in the Project Company:
  - A Sponsors' corporate lenders may impose negative pledge provisions under which the Sponsor is not to give security over its assets to any third party.
  - Cumbersome court procedures may make enforcement of a pledge over the shares too slow
  - There is a potential problem if the Sponsors wish to take out political risk insurance to protect their investment (assignment of interest in the shares assigned over to the insurers)
- Possible ways of dealing :
  - Use of an offshore intermediate holding company
  - Call option over Project Company's shares
  - Golden share given to the Lenders to allow them to appoint directors if the loan is in default

8. Financial Close – Conditions Precedent

- In order to draw down any debt at all, the project must first reach **Financial Close**
- This is the **date at which all Project Contracts and financing documentation have been signed** and the conditions precedent to the effectiveness of the lenders' commitments have been satisfied or waived.
- The **conditions precedent** are a checklist of documents and conditions the lenders require as the basis of their financing
- **Typical requirements** by lenders include:
  - Corporate documentation
  - Project documentation (all Cps met, all permits in place, NTP given to Contractor)
  - Financing documentation
  - Security documentation & registration of security
  - Financial Due Diligence(final reports from advisers, financial model audited, evidence of funding, insurance in place)
  - Legal Due Diligence (legal opinions, no litigation etc..)

8. Financial Close – Conditions Precedent

When CPs are circular : simultaneous closing can be arranged

- There may be **further conditions precedent** to each individual drawing of the debt
  - Confirmation by Independent Engineer and Project Company that amounts are due
  - Construction is on schedule and drawing is within construction budget
  - No event of default
- Lenders may also **require that no material adverse change** MAC to the project should have occurred after the financial documentation was signed as condition precedent

9. Representations and Warranties

- **Representations and Warranties** set out the facts that form the basis of the lenders' provision of the project finance
- If any are later found to be **incorrect this will create an event of default**
- **Typical representation and warranties** provisions in the finance documentation are that the Project Company:
  - Is duly incorporated and has the power and has taken all necessary corporate actions to undertake the project and the financing
  - Has no business, assets or subsidiaries, nor any contractual obligations, except those relating to the project
  - no event of default or force majeure has occurred affecting the Project Company or any Project Contracts
  - Has obtained all licenses and Permits required for the project and these are still valid
  - Has prepared budgets and projections in good faith

9. Representations and Warranties

- The **Sponsors** themselves may also be required to provide similar representations and warranties directly to the lenders
- These representations and warranties are made on signing of the financing documentation and are usually deemed to be repeated at Financial Close; they may also be deemed to be repeated when each drawing is made and on each interest payment or loan repayment date.

10. Covenants

- **Covenants** are undertakings by the Project Company either to take certain actions or not to do certain things
- Through the covenants the lenders exercise their continuing control over the construction and operation of the project
- The **main purposes of the covenants** are:
  - to ensure that the project is constructed and operated as agreed with the lenders
  - To give lenders advance warning of any problems that might affect the Project Company
  - To protect the lenders' security
-

10. Covenants

- A **temporary or permanent waiver** can be given if the Project Company is not able to comply with a covenant, for what the lenders consider to be a good reason.
- **Positive Covenants** include for example:
  - maintain its corporate existence, make all required corporate filings and pay taxes when due
  - Construct, operate and maintain the project in accordance with the contracts, law and good industry practice
  - Provide the agent or security trustee and lenders' advisers with reasonable access to the project and its records
- **Negative Covenants** include for example:
  - undertake any business other than the project
  - Amend its constitutional documents
  - Merge or consolidate with any other entity

11. Events of Default (continued)

- Project finance lenders create a **defined set of triggers** that gives them the right to take action against the Project Company
- These are **events of default** in which the Project Company is no longer able to manage the project without lender involvement.
- **Typical events of default** are for example:
  - the Project Company fails to make any payment under the financing documentation on its due date
  - Any representation or warranty made by the Project Company proves to have been incorrect or misleading
  - The Project Company does not fulfil any of its covenants or undertakings under the finance documentation
  - Any project contract is terminated
- Lenders may also wish **to add a MAC clause** as an event default
- Lenders may wish **to include potential events of default**
- The Project Company needs to **secure periods of grace to remedy the events of default**, If remedy is possible
- Some **materiality limitation** may be reasonable for some of the events of default
- There is a considerable potential for **overlap between representations and warranties, covenants and events of default**

12. Waivers, Amendments and Enforcement on Default

Various courses of action are open to the lenders after an **event of default**:

- To waive the event of default
- If the project is still under construction, to freeze any further drawings of funds
- If the project is operating, to require that all net cash flow be applied to reduction of debt or held in a separate reserve or escrow account under the lenders' control
- To enforce the lenders' security

- It is in the **lenders' discretion** which of these actions they choose to take

- The **Project Company can also ask** the lenders to waive or amend a particular term of financing documentation so it does not fall into default in the first place

- In the case of a **syndication** the agent bank or security trustee needs to have a clear instructions from the lenders as a whole on what action is to be taken on their behalf. Voting mechanisms therefore have to be agreed for example:
  - Waivers and permissions
  - Amendments to financing documents
  - Enforcement

12. Waivers, Amendments and Enforcement on Default

- Getting **banks to vote** is difficult as it is time consuming and involves a lot of organisation
- One solution is the **silence equals consent route**
- Drawing precise dividing lines between when the lenders can make their own decision and when the ECA or IFI's decision applies may be a matter of some debate

13. Intercreditor Issues

- It is common to have **more than one group of lenders** in project finance
- Each of these groups will have their **own loan agreement** with the Project Company
- A minimum **Intercreditor arrangements** need also to be established:
  - common arrangements for Financial Close
  - Pro rate sharing of security
  - Common voting arrangements for waivers, amendments and enforcement action
-

13. Intercreditor Issues

- it is preferable for the intercreditor arrangements to extend well beyond this through the signature of a much wider ranging **Common Terms Agreement**. Provisions are set out in the Common Terms Agreement such as:
  - a common repayment schedule
  - Conditions precedent to Financial Close and drawings
  - Agreement on priority of drawings on each loan and adjustments between lenders at the end of construction
  - Representations and warranties
  - Covenants
  - The cash flow cascade and Reserve Accounts
  - Events of default
  -
- There is a **legal benefit** to a Common Terms Agreement and it makes negotiations easier

13. Intercreditor Issues (continued)

- Further **intercreditor issues** arise if groups of lenders are not on a similar footing:
  - Interest swap providers
  - Fixed rate lenders
  - Lenders with different security
  - Lessors
  - Subordinated or mezzanine lenders

14. Market Disruption

- The surge of interest in market disruption is a global development affecting most lending sectors.
- Market disruption provisions are a common feature of syndicated loan agreements.
- These provisions set out how the interest rate applicable to loans will be calculated
- Two situations in which the market disruption provisions can come into play:
  - When LIBOR (or any other floating rate) cannot be determined
  - When one or more Lenders notify the Facility Agent that the cost of match funding in respect of that loan would be higher than the LIBOR rate applying to that loan under the loan agreement
- There are a number of issues around invoking the market disruption for borrowers and lenders
- For borrowers it will alter the cash flow burden and may have a negative impact on financial covenant performance

15. Market MAC

- Due to the recent crisis lenders' consideration of the market material adverse change (MAC) clause in syndicated lending arrangements has increased
- Market MAC clauses are typically found in the mandate letter for a syndicated loan and provide the Mandated Lead Arrangers (MLAs) with a means to renegotiate, or step away from, the underwriting or syndication in the case of a change in events or circumstances which affect the international or domestic lending or capital markets
- The key question facing MLAs in the current market conditions is whether the current events and circumstances are sufficient to invoke the market MAC.

Market MAC (continued)

- *“ The obligations of each Mandated Lead Arranger and each Underwriter under the Mandate Documents are subject to the absence, in its opinion, of any events or circumstances , which in its opinion have adversely affected or could adversely affect:*
  - *(1)*
  - *(2)*
  - *(3)the international or any relevant domestic syndicated loan, debt, bank capital or equity market which in the opinion of the relevant Mandated Lead Arranger or Underwriter could prejudice syndication of the Facility/ies.*
  - *During the period from the date of [this letter/the Term Sheet] to the date of signing of the Facility Documents”.*

12 - Simulations

Stand Alone Risk Apraisal

Risk inherent in a project without consideration of diversification

Sensitivity analysis

- calculate a base case NPV
- Change one variable and recompute NPV

Scenario analysis

- NPV based on 3 scenarios: base case, best case and worst case
- The final NPV is a weighted average of the 3 NPV

Monte Carlo simulations

- To run a variety of scenarios, to build a distribution of returns
- This provides a project risk: standard deviation if normality is assumed

Modeling

How to decide between two projects:
- Separate calculations
- One single calculation on the “differential” project

How to decide between dependant projects
Ex: pipeline versus storages

How to decide between ‘to do’ and ‘not to do’

How to decide to wait: Real options
- if I wait, I get additional knowledge/information
- if I wait, I loose an opportunity, I increase/decrease risks !

When to decide to stop a project, or to evaluation the duration
When to decide to replace equipment

Decision Optimization

Rules to evaluate capacities

Evaluation of Investments required for different Capacities:

$$\frac{I_1}{I_2} = \left(\frac{C_1}{C_2}\right)^k$$

With I : Investment Costs, and C: Capacity
and
k lower than 1, to take into account the economy of scale.
k = 2/3: ratio surface/volume for pipes

Sensitivities

Sensitivities:

The output NPV is directly calculable from
- hypothesis
- rules
- constants

Risk can first be grasped thanks to sensitivity calculation with respect to the model:

We calculate sensitivities through a small variation of an input (called risk factor), we observe the variation of the NPV.

$$\text{Sensitivity} = \frac{\Delta \text{RiskFactor}}{\Delta \text{NPV}}$$

Uncertainty-variance

The NPV calculated is the a mean.
The risk is grasped with the calculation of a statistical distribution of the NPV, while varying various risk factors.

The Risk Factors variations are defined as SCENARIOS.

The easiest way to generate multiple scenario, is to identify the statistical distribution of each risk factors, and draw a random scenario from these distributions. Then the NPV is calculated for each scenario.

This is called the MONTE CARLO simulations.

The main indicator is simply to get the standard deviation of the NPV.
Then, we can position the project into the graph (Risk, Return) and select the best projects accordingly.

Uncertainty-Correlation

In order to complete a Portfolio Analysis, the remaining indicator is the correlation between any two projects.

This is the most difficult indicator to get, even if a correlations is always between -1 and 1.

Usually, the correlation is calculated through a calculation of historical data. This is not possible with projects.

The best alternative is to do this calculation on data observed on projects belonging to different business categories, for instance chemical plants, automakers, oil production...

Financing Choice: Portfolio Theory

- Combined cash flow variance (of project and sponsor) with joint financing increases with:
  - Relative size of the project.
  - Project risk.
  - Positive Cash flow correlation between sponsor and project.
- Firm value decreases due to cost of financial distress which increases with combined variance.
- Project finance is preferred when joint financing (corporate finance) results in increased combined variance.
- Corporate finance is preferred when it results in lower combined variance due to diversification (co-insurance).

Financing Choice: Options Theory

- Downside exposure of the project (underlying asset) can be reduced by buying a put option on the asset (written by the banks in the form of non-recourse debt).
- Put premium is paid in the form of higher interest and fees on loans.
- The underlying asset (project) and the option provides a payoff similar to that of call option.

Financing Choice: Options Theory

The put option is valuable only if the Sponsor might be able/willing to exercise the option.

The sponsor may not want to avail of project finance (from an options perspective) because it cannot walk away from the project because:

- It is in a pre-completion stage and the sponsor has provided a completion guarantee.
- If the project is part of a larger development.
- If the project represents a proprietary asset.
- If default would damage the firm's reputation and ability to raise future capital.

Financing Choice: Options Theory

Derivatives are available for symmetric risks but not for binary risks, (things such as PRI are very expensive).

Project finance (organizational form of risk management) is better equipped to handle such risks.

Companies as sponsors of multiple independent projects: A portfolio of options is more valuable than an option on a portfolio.

Financing Choice: Equity vs. Debt

Reasons for high debt:

- Agency costs of equity (managerial discretion, expropriation, etc.) are high.
- Agency costs of debt (debt overhang, risk shifting) are low due to less investment opportunities.
- Debt provides a governance mechanism.

Valuation Issues in Projects

- Projects are exposed to non-traditional risks (discussed earlier).
- Have high and rapidly changing leverage.
- Typically have imbedded optionality.
- Tax rates are continuously changing.
- Projects have early, certain and large negative cash flows followed by uncertain positive cash flows.

Failure of Traditional Valuation

Usage of Corporate WACC is inappropriate:

- Different risk profile of the project from the sponsor.
- Project has rapidly changing leverage.
- Considers promised return on risky debt and not expected return.

Traditional DCF method is inaccurate:

- Single discount rate does not account for changing leverage.
- Ignores imbedded optionality.
- Idiosyncratic risks are usually incorporated in the discount rate as a fudge factor.

Non-Traditional Approaches

- Using Capital Cash Flow method which acknowledges changing leverage and uses unlevered cost of capital.
- Usage of non CAPM based discount rates especially for emerging markets investments.
- Valuation of risky debt as a portfolio of risk free debt and put option.
- Incorporation of imbedded Optionality: Valuation of Real Options.
- Usage of Monte Carlo Simulations to incorporate idiosyncratic risks in cash flows and to value Real Options.

Capital Cash Flow Method

Computing capital cash flow:

- Take Net Income (builds in tax shields directly)
- Add depreciation and special charges,
- Add interest
- Subtract change in NWC and
- Subtract incremental investment.

Discount capital cash flow with unlevered cost of equity to arrive at firm value.

Equity value can be derived by subtracting risky debt value.

Advantages:

- Incorporates effect of changing leverage.
- Avoids calculation of “debt” discount rate. Assumes tax shields are at similar risk as whole firm.

Discount Rate for Project Finance

Corporate WACC is an inappropriate discount rate (discussed above).

Incorporate idiosyncratic risks in cash flows and account for systematic risks in discount rate. Avoid double accounting.

Ensure that discount rate is consistent with the cash flow: unlevered rate for capital cash flows.

Discount Rate in Emerging Markets

This is a major area of concern:

- Many mega projects are in emerging markets.
- Many of these markets do not have mature equity markets. It is very difficult to estimate Beta with the World portfolio.
- The Beta with the World portfolio is not indicative of the sovereign risk of the country (asymmetric downside risks). E.g. Pakistan has a beta of 0.
- Most assumptions of CAPM fail in this environment.

Many Alternatives!

Approaches to calculating the Cost of Capital in Emerging Markets:

- World CAPM or Multifactor Model (Sharpe-Ross)
- Segmented/Integrated (Bekaert-Harvey)
- Bayesian (Ibbotson Associates)
- CAPM with Skewness (Harvey-Siddique)
- Goldman-integrated sovereign yield spread model
- Goldman-segmented
- Goldman-EHV hybrid
- CSFB volatility ratio model
- CSFB-EHV hybrid
- Damodaran

Many Alternatives!

Many of these methods suffer problems:

- Method does not incorporate all risks in the project.
- Assume that the only risk is variance. Fail in capturing asymmetric downside risks.
- Assume markets are integrated and efficient.
- Arbitrary adjustments which either over or underestimate risk.
- Confusing bond and equity risk premium.

The Country Risk Rating Model

Steps:

Cost of Capital = risk free + intercept - slopexLog(IICCR)

Where Log(IICCR) is the natural logarithm of the Institutional Investor Country Credit Rating

Gives the cost of capital of an average project in the country.

If cash flows are in local currency, then add forward premium less sovereign risk of the currency to the cost of capital.

Adjust for global industry beta of the project.

Adjust for deviations in the project from the average level of a given risk in the country

The Country Risk Rating Model

Risks incorporated in cash flows:

- Pre-completion: technology, resource, completion.
- Post-completion: market, supply/input, throughput.

Risks incorporated in discount rate:

- Sovereign risk: macroeconomic, legal, political, force majeure.
- Financial risk.

Valuing Risky Debt

Differentiate between expected yield and promised yield.

Options approach:

- Face value of corporate debt: k (strike price)
- Underlying assets of the firm: S
- Equity value: C(k) (call value with strike price = k)
- Riskless debt: PV (k,r) (r: risk free rate of interest)
- Put option: P(k) (put value with strike price = k)
- By Put-Call Parity: S = C(k) + PV (k,r) – P(k)
- **Value of risky debt, V(D): PV (k,r) – P(k)**

Valuing Multiple Classes of Risky Debt

- Senior debt: face value = D1; strike price, k1 = D1.
- Junior debt: face value = D2; strike price, k2 = D1+D2.
- Value of senior debt, V(D1) = V(riskless,D1) – P(k1)
- Value of junior debt, V(D2) = V(riskless,k2) – P(k2) – V(D1)
- Value of total debt, V(D) = V(D1) + V(D2)

13-Real Options

Real Options

Real options are rights that allow managers to make decisions in the future that can alter the value of a project

If the change of value is negative: the real option will not be exercised

If the change of value is positive, the manager can consider an exercise of the option

Different types of options can be taken into account:

- Time option: option to delay the start of the project
- Sizing option: option to alter the size of the project
- Stop option: option to stop the project
- Flexibility option: options to change drastically the project
- Go no go option: window period within which the decision to do the project is possible

All options have a positive value, because your are always the holder of the option

Value of Project with Options > Value of Project without Option

REAL OPTIONS ARE VALUE ENHANCING

Real Options

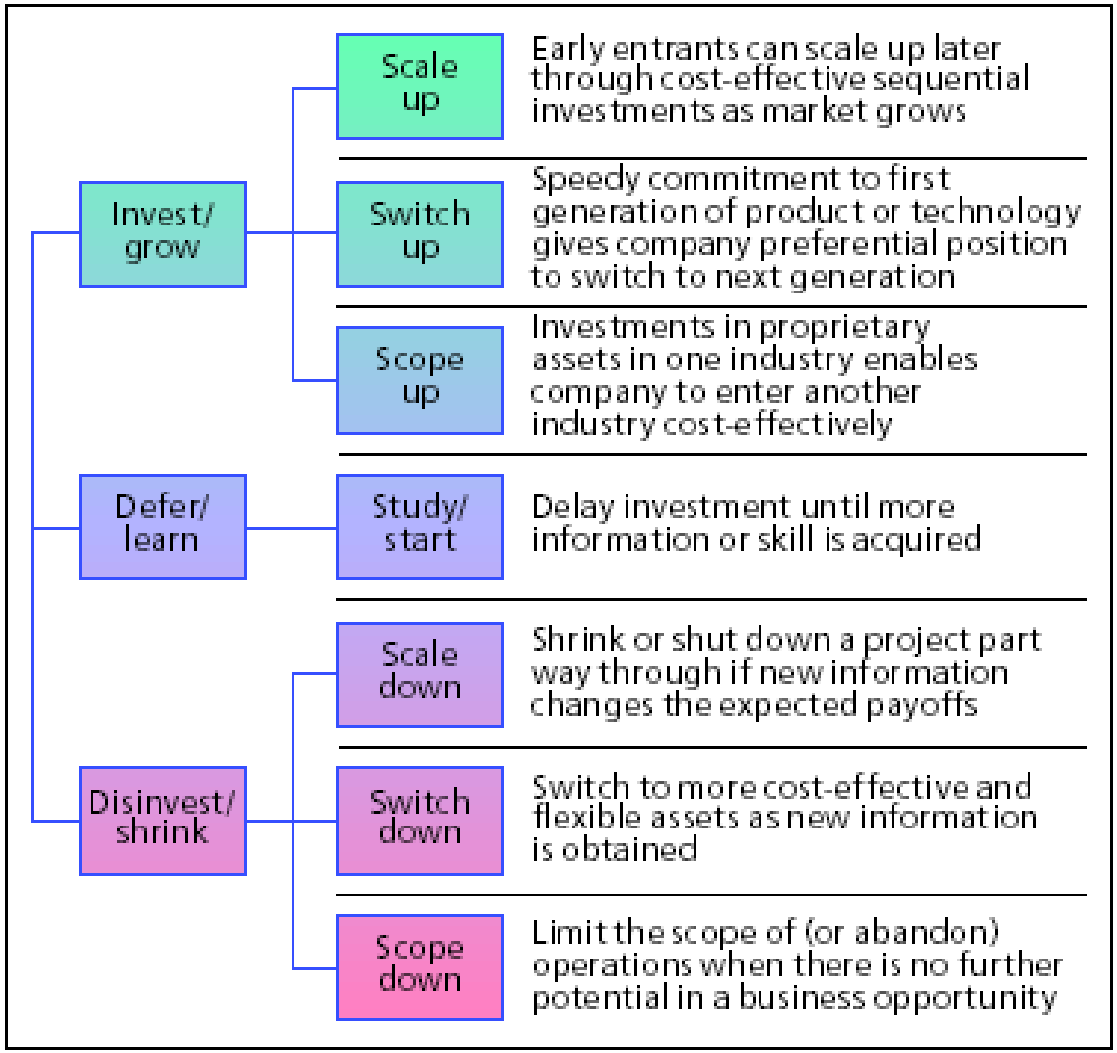
Marginal Return, when the investment is variable, it is the corresponding variation of the return for an elementary increase of the investment.

The return is maximum when the marginal return equals the discounting rate

Optimum:

In real or nominal term

Real Options: Generic Types



Real Options in Project Finance

- Scale up: Are usually in the form of replication. These also include contractual real options in the form of leases etc. Affects project NPV.
- Switch up: Affects project NPV.
- Scope up: Affects value of Sponsors involvement.
- Study/start: Affects project NPV. Critical for stock type projects where precise estimation of reserves is critical to success.
- Scale down: Mostly applicable in the pre-completion stage. Scale down is rarely an option post-completion since projects are valuable almost exclusively as going concerns. Affects project NPV.
- Switch down: Rarely an option for a project.
- Scope down: Similar to the scale down option.
- Flexibility option: The option to switch input or output mix is key to projects and can help reduce cash flow volatility. Affects project NPV.

Real Options: Industry Examples

Automobile: Recently GM delayed its investment in a new Cavalier and switched its resources into producing more SUVs.

Aircraft Manufacturers: Parallel development of cargo plane designs created the option to choose the more profitable design at a later date.

Oil & Gas: Oil leases, exploration, and development are options on future production; Refineries have the option to change their mix of outputs among heating oil, diesel, unleaded gasoline and petrochemicals depending on their individual sale prices.

Telecom: Lay down extra fiber as option on future bandwidth needs

Real Estate: Multipurpose buildings (hotels, apartments, etc.) that can be easily reconfigured create the option to benefit from changes in real estate trends.

Utilities: Developing generating plants fired by oil & coal creates the option to reduce input costs by switching to lower cost inputs.

Airlines: Aircraft manufacturers may grant the airlines contractual options to deliver aircraft. These contracts specify short lead times for delivery (once the option is exercised) and fixed purchase prices.

Real Options: Valuation Approaches

Black Scholes formula (close out formula)

- The PV of expected cash flows: requires the volatility of the asset
- It is difficult to find real world situations which fulfill assumptions underlying this model

Binomial Option Pricing model:

- The most illustrative method.
- Have to incorporate varying risks of cash flows at each decision node. It is better to risk adjust the cash flows and use a risk free rate.

Monte Carlo Simulation:

- The most robust and accurate method.
- Easy to integrate multiple and interacting real options.
- Can be used to accurately value an option when multiple assets are present (basket option).

Proposal

Premise of Structure irrelevance		Real World situations
No transaction Costs	⇨	Very high transaction costs that can affect the investment decision.
No taxes	⇨	Taxes are mostly positive and high and results in valuable tax shields.
No cost of Financial Distress	⇨	Capital and governance structure decreases risk thereby decreasing cost of distress.
No agency conflict	⇨	Behavior of various parties can be controlled through structure.
No asymmetric Information	⇨	Type and sequence of financing can improve information.

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