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THE FINANCIAL EVALUTATION OF INVESTMENTS: THE TIME VALUE OF MONEY, THE PRESENT VALUE, NPV, IRR

Lesson 9

Corporate Finance

Castellanza, 7th November 2018

SUMMARY

- The investment definition and analysis
- Financial value of time
- The cash-flow model
- The present value notion
- Capital budget techniques

SUMMARY FROM THE PREVIOUS LECTURES

- In the previous lecture it has been analysed how a company finances its investments if financial flows deriving from the difference between revenues and costs are not sufficient.
- In general a company needs financing sources (debt, equity and "quasi-equity" products) to cover investments in assets and working capital needs.
- In this lecture we will focus on the investment itself and how to evaluate if a certain investment can be profitable for the company and/or for its shareholders.

THE INVESTMENT: DEFINITION

How can an investment be defined?

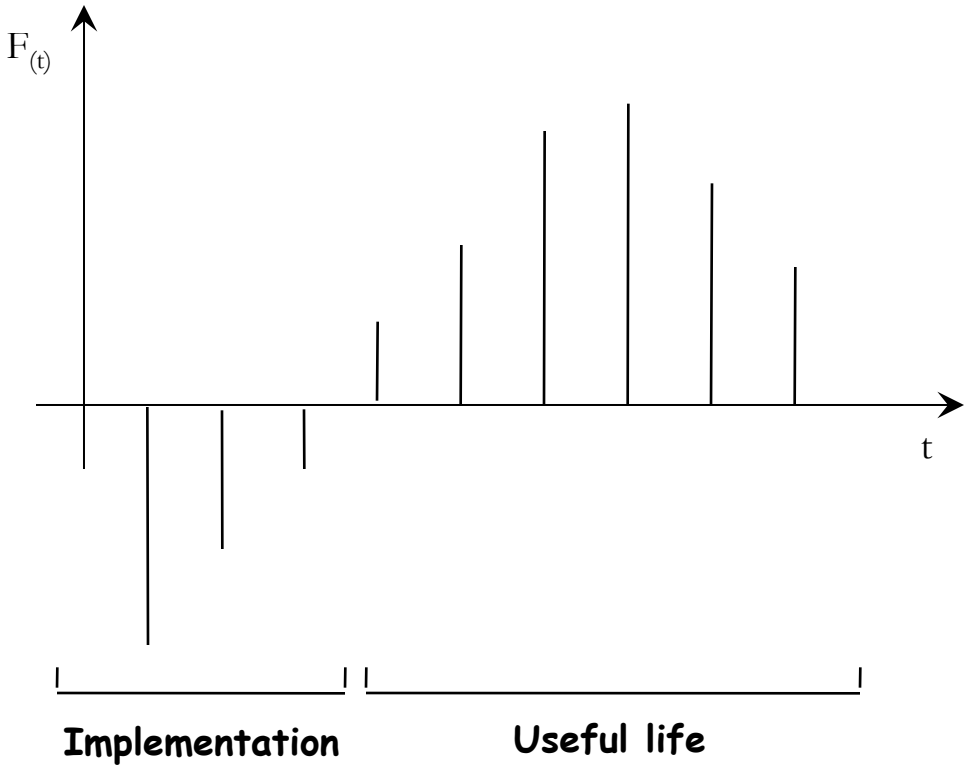
An investment is a transfer

of monetary resources over time,

mainly characterized by net outflows in the first stage

and net inflows in the following periods.

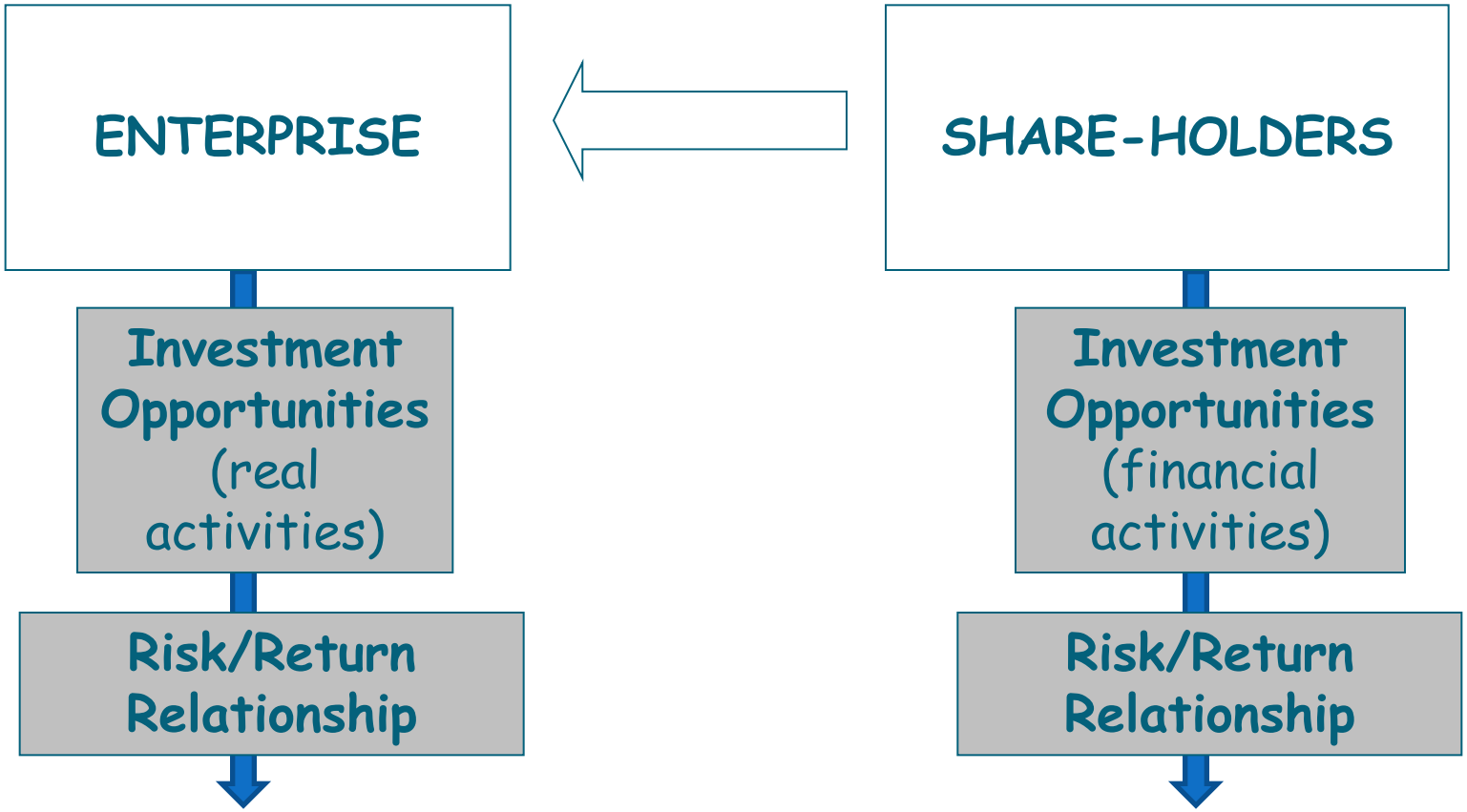
THE INVESTMENT: STRUCTURE



THE INVESTMENT: MAIN PURPOSES

- We will focus on investment decisions such as:
  - increase productive capacity;
  - buy or improve plant and machinery (equipment investments decisions) / rationalize processes ("make or buy" decisions);
  - develop and strengthen products' and services' range;
  - acquisition strategies.
- The objective of the investment, or capital budgeting, decision is to find real assets which are worth more than they cost.

CAPITAL BUDGETING: FORCES AT PLAY



HOW TO FINANCE INVESTMENTS

- As we have already seen, investments can be financed through:
  - Equity (shareholders capital increase)
  - Shareholders loans
  - Financial debt: e.g. loans, bonds, others.
- The choice among this sources depends on:
  - Capital supply;
  - Enterprise conditions;
  - Economic effects;
  - Non-economic effects;
  - Financial flexibility.

THE INVESTMENT ANALYSIS: KEY STAGES

- The company has to go through the following stages before taking an investment decision:
  1. **Scouting** among different investments' options (strategic and commercial perspective);
  2. **Valuation of the selected options** from a technical perspective.
  3. **Valuation of the projects** from a financial point of view;
  4. **Selection** of the most profitable projects.

KEY INFORMATION FOR A CONSISTENT VALUATION

- To make an efficient valuation and to make the best choice among the investment opportunities, it is important to have clear information about:
  1. Invested capital;
  2. Investment duration;
  3. Costs and revenues connected to the investment;
  4. Cash flow generated by the investment;
  5. Terminal value of the invested capital at the end of the investment period;
  6. Risk related to the investment.

INVESTMENTS: FINANCIAL ANALYSIS

- The key drivers of the financial analysis are:
  - risk (connected to every investment)
  - return (the "result" generated by the investment)
  - time (the investment duration)

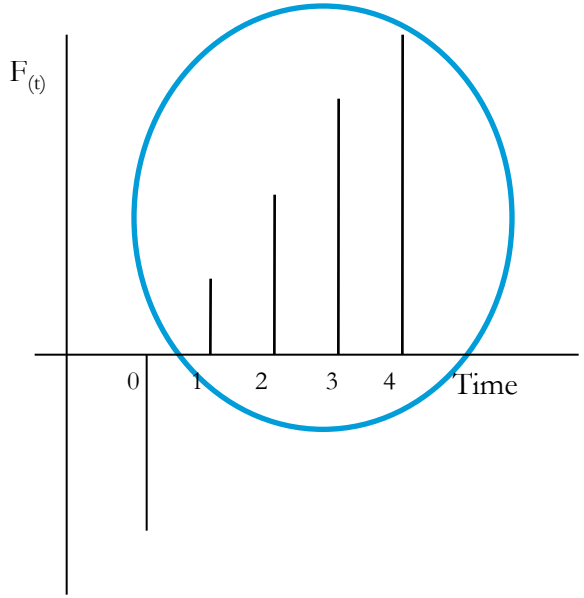
- Financial value of time
  - Cost of capital (fund raising)
  - Return of capital (investments)

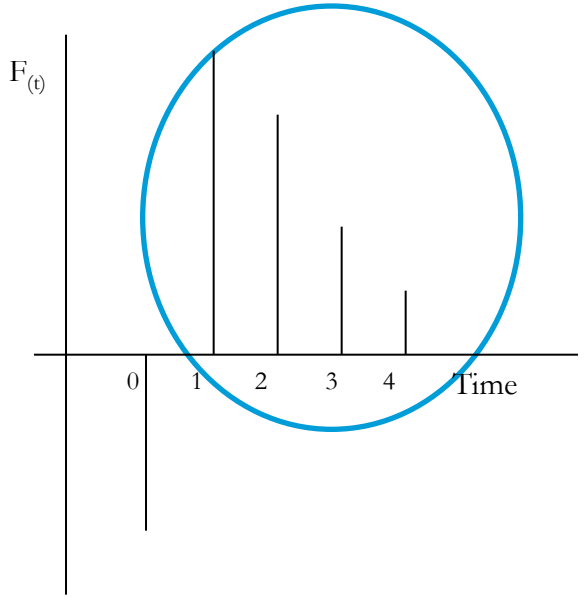
FINANCIAL VALUE OF TIME

- Time has a financial value due to:
  - **risk** (it is proportional to the probability that future cash flows will be effectively collected);
  - **flexibility** (possibility to reinvest present cash flow);
  - **temporal distribution of value** (preference for goods immedialtely avaiable).

- In fact, "*a dollar tomorrow is worth less than a dollar today*".

CASH FLOW TEMPORAL DISTRIBUTION





- Both the investments are characterized by the same initial outflow; however, the temporal distribution of the inflows is clearly different.
- This implies that the investments have different values.

INVESTMENT DECISION: HOW TO DECIDE

The analysis of cash flows

is the driver that allows the company/investor

to valuate the profitability and the suitabilitity

of an investment opportunity.

KEY DRIVERS FOR A CONSISTENT VALUATION

- From a financial perspective, it is necessary to take into account three main drivers to efficiently determine the value of an investments:

  - **the cash flow amount;**
  - **the temporal distribution of the cash flows;**
  - **the financial value of time.**

CASH FLOWS GENERATED BY INVESTMENTS

- The significant cash flows to be considered in the analysis are:
  1. Cash flow from operating activities.
  2. Cash flow after tax.
  3. Cash flow before financial expenses.
  4. Incremental cash flow (cash flows resulting from the investment- the aim is to calculate the investment's marginal contribution to the company's profitability).

Relevant cash flows determination

Ebit
+ Depreciation/Amortization
± Balance of source/use of Funds (Etp fund, others)
- Tax
= First Cash flow from current operations
± Changes in Net Working Capital
= Second Cash flow from current operations
- Capital Expenditures
+ Divestments
= Cash flow from operations ⇐ **Relevant cash flow**
± Financing flows
± Dividends & Changes in Equity
± Non recurring/Extraordinary flows
= Cash Balance (Δ Cash)

GUIDELINES FOR CASH FLOW DETERMINATION

- Do not confuse average and marginal returns (focusing only on marginal returns)
- Take into account "collateral" effects
- Do not forget to cover the working capital requirement connected to the investment
- Do not consider sunk costs
- Analyze opportunity cost
- Pay attention on the share-out/division of common cost
- Consider the present value of the fiscal benefits connected to amortization

Present Value

- Present Value (PV) is the value at a given date of a future amount of money, discounted to reflect the financial value of time.

$$PV = \frac{F_t}{(1 + k)^t}$$

Where:

F_t = cash flow generated by the investment

k = discount rate

$1/(1 + k)^t$ = discount factor

EXAMPLE

R = Net cash flow/ Investment = (F - I) / I

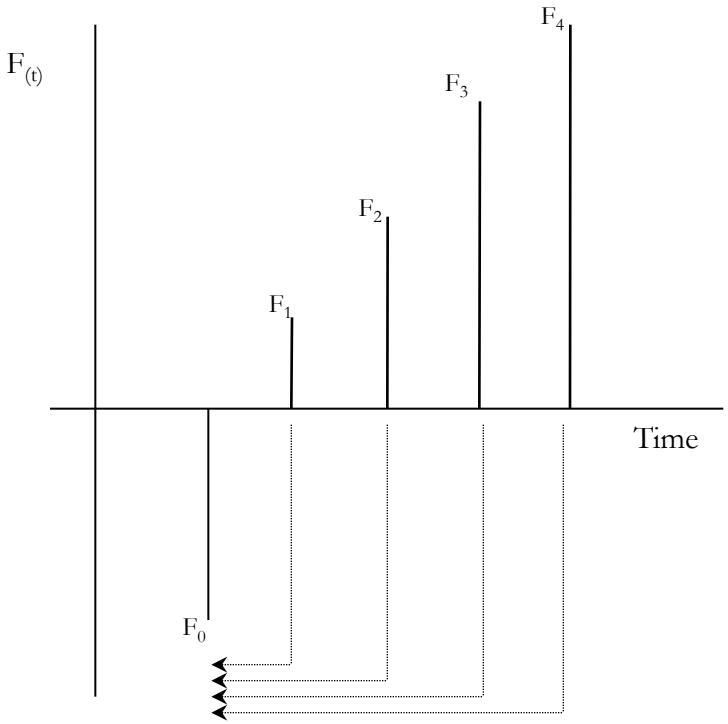
(120 - 100) / 100 = 20%

Considering financial value of time:

R = Discounted cash flow/ Investment = (F_a - I) / I

if k = 8%, (111 - 100) / 100 = 11%

Investment Present Value



Discount

$$PV = \sum_{t=1}^{n} \frac{F_t}{(1+k)^t}$$

Where:

F_t = cash flow on a given date t

n = number of period

k = discount rate

1/(1+k) = discount factor

EXERCISE 1

If k = 9%,

what is the PV of Euro 374 paid in year 9?

EXERCISE 2

If the PV of Euro 139 is Euro 125,

what is the DISCOUNT FACTOR?

EXERCISE 3

If the 8-year discount factor is 0.285,

what is the PV of 596 received in 8 years?

EXERCISE 4

A project produces the following cash flows:

Y	F
1	432
2	137
3	797

If k = 15%, what is the project's PV?

METHODS FOR THE INVESTMENTS VALUATION

- There are different methods to valuate and to compare investment's opportunities.

  - **The Net Present Value (NPV)**
  - **The Internal Rate of Return (IRR)**
  - **The Pay-Back Period (PBP)**

The Net Present Value (NPV)

- The Net Present Value is the value that an investment adds to a company, expressed as it is immediately available.
- It takes into account not only cash inflows generated by the investment, but also cash outflows needed to develop the investment plan.
- The NPV is the sum of each cash inflow/outflow discounted back to its present value (PV).
- NPV is the difference between present value and market value of the investment (usually, represented by F_0).

How to estimate the Net Present Value

1. Estimate of future cash flows of the investment for every year of the investment project.
2. Estimate of the discount rate.
3. Discount of future cash flows for every year.
4. Sum of discounted cash flows (= Present Value of the investment).
5. The NPV is simply the PV of future cash inflows minus the cash outflow needed to carry out the investment project.

The Net Present Value

- Considering an investment plan characterized by five cash inflows and only a single cash outflow at the beginning, the NPV formula is:

$$NPV = F_0 + \frac{F_1}{(1+k)^1} + \frac{F_2}{(1+k)^2} + \frac{F_3}{(1+k)^3} + \frac{F_4}{(1+k)^4} + \frac{F_5}{(1+k)^5}$$

$$NPV = \sum_{t=0}^{n} \frac{F_t}{(1+k)^t}$$

- F_t = cash inflows
- F_0 = cash outflow
- k = discount rate

THE NET PRESENT VALUE: PROPERTIES

- The NPV allows the company to valuate the added value generated by the investment plan.
- A project is profitable (in a financial point of view) only if its NPV has a positive value (NPV>0). Comparing investment's opportunities, the one with the higher NPV should be selected.
- If a project has positive NPV, it means that it is to generate more cash inflows than cash outflows.

THE NPV: PROS AND CONS

PROS:

- It takes into account financial value of time
- It considers both future cash flows and cost of capital (throughout the discount rate)

CONS:

- It is based on the "perfect markets" assumption

EXAMPLE

- Project: construction of an office building on a land. The construction will take 2 years and, when completed, the building will be sold and will be worth Euro 400.000. The project produces the following cash flows:

Period	t = 0	t = 1	t = 2
Land	-50.000		
Construction	-100.000	-100.000	-100.000
Payoff			+400.000
Total	-150.000	-100.000	+300.000

If k = 7%, what is the project's NPV?

EXAMPLE

$$NPV = -150.000 - [100.000/(1+0.07)] + [300.000/(1+0.07)^2]$$

$$NPV = -150.000 - [100.000/(1.07)] + [300.000/(1.07)^2]$$

$$NPV = -150.000 - [100.000/(1.07)] + [300.000/(1.15)]$$

$$NPV = -150.000 - 93.457,94 + 260.869,57 =$$

$$=18.573,67$$

The Net Present Value and the discount rate

- The PV and NPV of an asset vary in inverse proportion to the discounting rate (k)

F_0					2
Y	1	2	3	4	5
CF	0,8	0,8	0,8	0,8	0,8
Discounting rate					20%
Discounting factor	0,833	0,694	0,579	0,482	0,402
	0,667	0,556	0,463	0,386	0,322
PV					2,392
NPV					0,392
Discounting rate					30%
Discounting factor	0,769	0,592	0,455	0,350	0,269
	0,615	0,473	0,364	0,280	0,215
PV					1,948
NPV					0,052

The Internal Rate of Return (IRR)

- If NPV has always a value, then there must exist a discounting rate that makes NPV = 0.

The Internal Rate of Return

- In other words, it represents the maximum cost of the fundraising activity (in other words, the maximum sustainable cost of capital), in order to maintain the project's profitability.
- Basically, an investment whose IRR exceeds its cost of capital adds value to the company.

The Internal Rate of Return: formula

IRR: rate of return to project required to obtain an NPV = 0

$$\sum_{t=0}^{n} \frac{F_t}{(1+IRR)^t} = 0$$

THE INTERNAL RATE OF RETURN: CONSIDERATIONS

1. The IRR does NOT represent the return of the project, but the return of a combination of investments:
   - The original project;
   - The additional initiatives that are possible thanks to the the re-investment of the additional flows generated.
2. The IRR must be at least equal to the cost of capital; otherwise the investment is not profitable at all (from a financial perspective).

THE INTERNAL RATE OF RETURN: CONSIDERATIONS

- IRR is used frequently in financial markets because it immedialtely tells the investor the return to be expected for a given level of risk.
- The investor can compare this expected return with his required return tate, thereby simplifying the investment decision.

The Payback Period (PBP)

- The Payback period requires that the initial outlay of a project should be recovered within a specified period.
- The PBP is the length of time required to recover the initial investment of the project.
- It considers the initial investment.
- It considers the future cash flows generated by the investment and the time that those cash flows need to cover the initial investment.
- If PBP is less than the pre-determined cut-off, accept the project.

EXAMPLE – PBP & NPV

Consider Projects A and B:

Project	F_0	F_1	F_2	F_3	PBP, Years	NPV at 10%
A	-2.000	+ 2.000	0	0	1	-182
B	-2.000	+ 1.000	+ 1.000	+5.000	2	+3.492

- The NPV rule tells us to reject project A and accept project B.
- But if you look at how rapidly each project pays back its initial investment, with project A you take 1 year to recover the initial outflow and with project B you take 2 years.

EXAMPLE – PBP & NPV

- If the company used the payback rule with a cutoff period of 1 year, it would accept only project A; if it used the payback rule with a cutoff period of 2 more years, it would accept both A and B.
- Regardless the choice of the cutoff period, the payback rule gives a different answer from the NPV. WHY? Payback gives equal weight to all cash flows without considering any risk rate.

Project	F_0	F_1	F_2	F_3	PBP, Years	NPV at 10%
C	-2.000	+ 1.000	-500	+3.000	3	749.8

EXAMPLE – PBP & NPV

Consider Projects A, B and C:

Project	F_0	F_1	F_2	F_3	PBP, Years	NPV at 10%
A	-2.000	+ 1.000	+ 1.000	+5.000	2	3.492
B	-2.000	0	+ 2.000	+5.000	2	+3.409
C	-2.000	+ 1.000	+1.000	+ 100.000	2	74.867

The PB rule says that these projects are all equally attractive. But project A has a higher NPV than project B; and project C has a higher NPV than either A & B.

In order to use the PB rule a firm had to decide on an APPROPRIATE cutoff date and to use in the same time different valuation techniques.

EXERCISE – PBP

a) What is the PBP on each of the following projects?

Project	F_0	F_1	F_2	F_3	F_4
A	-5.000	+ 1.000	+ 1.000	+3.000	0
B	-1.000	0	+ 1.000	+2.000	+3.000
C	-5.000	+ 1.000	+1.000	+ 3.000	+5.000

b) Given that you wish to use the PB rule with a cutoff period of 2 years, which projects would you accept?

c) If you use a cutoff period of 3 years, which projects would you accept?

d) If K = 10%, which projects have positive NPVs?

Exercise – Solution

a) A = 3 years, B = 2 years, C = 3 years

b) B

c) A, B and C

d) B and C (NPV A = -1.010,52, NPV B = 3.378,15, NPV C = 2.404,55)

EXERCISE – NPV

a) Calculate the NPV of the following project for discount rates (K) of 0, 50 and 100 percent:

F_0	F_1	F_2
-6.750	+ 4.500	+ 18.000

Exercise – Solution

a) $0\% = -6.750 + 4.500 + 18.000 = 15.750$

$50\% = -6.750 + 4.500/(1.5) + 18.000/(1.5)^2 = 4.250$

$100\% = -6.750 + 4.500/(2) + 18.000/(2)^2 = 0$