

**BUSINESS MANAGEMENT**

Project  
Analysis

# PROJECT EVALUATION

- Investment decision

Values related with acquisition of fixed assets

- Types of investment

- Financial (ex. parts of capital of another firm; criterion is the rate of return)
- Not directly productive (ex. tangible or intangible fixed assets; criterion is the improvement of conditions of the production process)
- Productive – substitution/expansion of production capacity (ex. good or tangible fixed asset; criterion is the increase in quality and production efficiency)

# PROJECT EVALUATION

- Investment decision
  - Types of investment
    - Productive investment of substitution kind imply small amount of uncertainty and novelty, it is only meant to optimize de production system
    - **Productive investment of expansion kind** have a more complex decision making and involve higher uncertainty (ex. costs and benefits) and innovation, it is required a study on the return

# PROJECT EVALUATION

- Investment decision

- Components of the investment project

- Market analysis – environment, strategy,...
    - Technical study – technology, production process,...
    - Quantification of the investment
    - Financial study – source of funds, costs,...



Costs and profits in project evaluation

# PROJECT EVALUATION

- Investment decision
  - Costs and profits in project evaluation
    - Capital invested – **variations** in tangible and intangible fixed assets, stocks, accounts receivable and accounts payable **implied by/resulting from the project**
    - Operating revenues and expenses – new **revenues and costs (or reductions and increases in revenues and costs) directly associated with the Project / resulting from the project**, sales, raw materials, personnel,..., and their time schedule, cost before interest and depreciation (financial costs and profits are treated in the “Financial study”)
    - **Sunk Costs** (irreversible investments) are not considered

# PROJECT EVALUATION

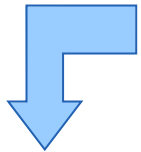
- Investment decision
  - Costs and profits in project evaluation
    - Life time period – project life time, determined by physical capacity reasons of the equipment, obsolescence or commercial
    - Liquidation value – value of equipment at the end of life time, costs of shutting down the project, rebuilding of accounts receivable, stocks and accounts payable to their value without the project implications
    - Cost of capital – interest rate (i.e., opportunity cost), cost of equity and debt

# PROJECT EVALUATION

## ■ Investment decision

### ■ Main criteria in project evaluation

Methods to treat the information on project evaluation variables



■ **Payback period** – minimum amount of time of running the project to, with receipts-expenses flows, pay for the investment costs

Criterion is choose the smaller payback period

- advantages: compare projects with different life times; if there are large risks of changes in the future; simplicity
- disadvantages: absence of cost of capital; there are projects with smaller payback period but yielding smaller return when considering the whole life time

# PROJECT EVALUATION

- Investment decision

- Main criteria in project evaluation

- Net present value (NPV) – sum of expenses, receipts and investment, discounted (by the cost of capital)



$$VAL = \sum_{t=0}^n \frac{-I_t}{(1+i)^t} + \sum_{t=1}^n \frac{R_t - C_t}{(1+i)^t} + \frac{V_R}{(1+i)^n}$$

Criterion is  
choose  
NPV > 0;  
project with  
larger NPV

- advantages: based on best real estimates for every element of the project; takes into account the cost of capital; most widely used
      - disadvantages: can not apply to projects with different life time



# PROJECT EVALUATION

- Investment decision
  - Main criteria in project evaluation
    - Net present value (NPV)
      - **Solutions** for the case of **different life time**:
        - Consider that the project with shorter life time replicates enough times until it meets a common life time; note that it is assumed that every element of the project remains unchanged
        - Consider the project of shorter life time and that other longer lived projects are liquidated at that shorter life time; note that, e.g., it can be hard to evaluate the liquidation value

# PROJECT EVALUATION

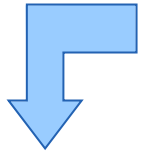
- Investment decision
  - Main criteria in project evaluation
    - Net present value (NPV)
      - **Solutions** for the case of **different life time**:
        - Determine the “annual equivalent value” (“aev”), i.e., the value of the annuity with NPV equal to that of the project (1-compute the NPV of each project, 2-compute the annuity “aev”, 3-select the project with larger “aev”); note that the “aev” obtained can be very different, in which case should use the return index, i.e.,  $NPV / (\text{present value of capital investments})$ , rendering a hierarchy of returns, but it requires a clear distinction between investment and operating expenditures

# PROJECT EVALUATION

- Decisão de investimento

- Main criteria in project evaluation

- Internal rate of return (IIR) – rate of discount that makes NPV=0, i.e.,



Criterion is  
choose  
IIR>i;  
project with  
larger IIR

$$VAL = \sum_{t=0}^n \frac{-I_t}{(1+i)^t} + \sum_{t=1}^n \frac{R_t - C_t}{(1+i)^t} + \frac{V_R}{(1+i)^n}$$

- advantages: not influenced by estimates of the cost of capital; from the financial point of view is the highest cost that the investor would afford without making losses; mainly useful in eliminating projects;
      - disadvantages: IIR is not really available for re-investing

# PROJECT EVALUATION

- Investment decision
  - NPV and IIR: notable cases
    - Two projects with identical NPV may differ in their IIR
    - Two symmetric projects may have and identical IIR, while one has positive NPV and the other a negative NPV
    - If a project delivers mainly positive cash flows at the beginning of the life time and negative towards the end of it (which is unusual), then IIR indicates a different decision than that indicated by NPV (e.g. exercise 3 of Part B of the Financial Calculus and Project Evaluation exercise list)
    - IIR is, in the vast majority of projects, multiple
    - NPV is based on best real estimates; IIR is fictitious
    - **NPV should prevail as the selection criterion**

# PROJECT EVALUATION

- Investment decision
  - Sensitivity analysis
    - Construct scenarios, estimate risks, associate probabilities to the realization of the various components
  - A case
    - Receipt can be the firm does not have to pay anymore (to a supplier)
    - Expense can be what the firm does not receive anymore (ex. rent of the land used for the project)
    - Receipts and expenses are the differences with respect to the alternative (i.e. absence of project)