INVESTMENT PROJECT ANALYSIS

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Relevance

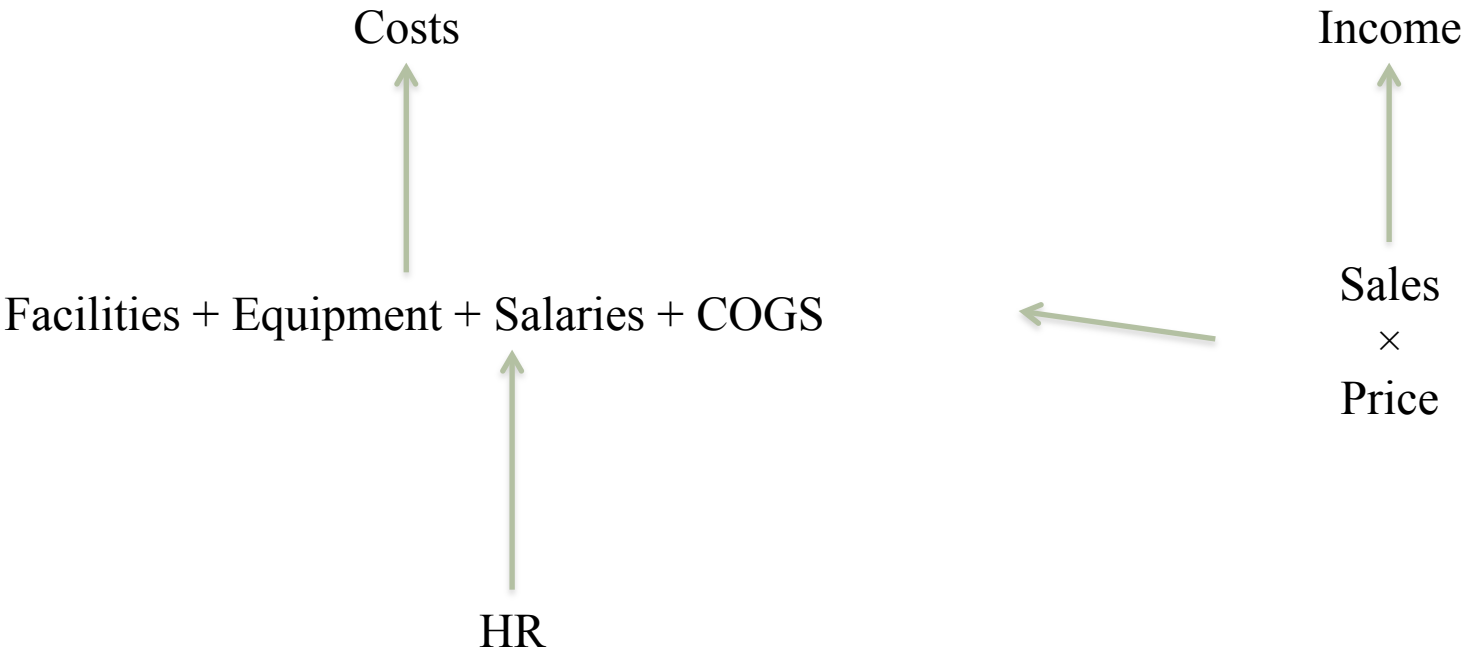
- Long-term decisions
  - definition of new strategic orientations (products, services, markets)
  - loss of flexibility

- Investment
  - too much - unnecessary expenses
  - less or not timely - loss of competitiveness due to lack of quality; loss of customers due to lack of capacity

Project types

- Expansion
  - growth in existing products or markets
  - growth for new products or markets
- Replacement
  - business maintenance
  - cost savings
- Investigation and development
- Safety and environment

Fundamental factors



Organization of financial analysis

Analysis components

F. A.

1. **Investment** analysis [Balance sheet]
2. Project **operation** earnings analysis [P&L Statement]
3. **Working capital** investment analysis [Balance sheet]
4. Project **residual value** analysis [Balance sheet+ P&L Statement]
5. **Cash-flow reconstitution** [P&L Statement]
6. **Discounted cash-flow** analysis [Financial Math]

Organization of financial analysis

1. Investment

- R&D activities, project
  - R&D or project facilities and equipment
  - People
  - Studies, regulation
- Facilities and equipment
  - Types, Costs, Quantity, Dates

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2. Project operation earnings

- Income
  - Competition (number of competitors, differentiation)
  - Demand structure (diversity of needs met, number of customers, growth rate, purchase frequency)
  - Adoption (need for training, degree of change in usage patterns, need for complementary products / services, commitment to previous technologies, perceived risk, beneficiary / payer alignment)
  - Price (value created for the customer, easier to make explicit and value in intercompany business)
  - …

P&L

2. Project operation earnings

- HR costs
  - Roles and number of people at each moment (production, R&D, sales, administrative, general)
  - Wages/salaries (including health, social security, etc.)
- Production costs
  - Leased facilities
  - Costs of materials consumed
  - Contrast with industry averages
  - Sales percentages for materials consumed, R&D, sales and marketing, general and administrative costs

P&L

2. Project operation earnings

Operacional earnings

- Income
  - Sales: Goods, Products
  - Services rendered
- Costs
  - Costs of goods sold and materials consumed
  - Supplies and external services
  - HR
  - Depreciation and provisions

P&L

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3. Working capital investment

- Working capital - part of the investment that directly finances the day-to-day operation.
  - Stocks
  - Customer Credits
  - Mitigated by credits with suppliers
  - Activity fluctuations
  - Other short term commitments

- Expressed as a percentage of sales.
- It depends on activity level and is typical by industry

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Organization of financial analysis

4. Project residual value

- Residual value
  - Cash flow from sale of assets
  - Impact on sales profit / loss taxes

- Alternative
  - Last year's cash flow perpetuity, with growth rate

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5. Cash-flow reconstitution

- *Cash-flows* (CF) vs Net earnings
  - Sales and costs - part may be on credit → (-) Inv. W. C.
  - Depreciation - does not match outflows → (+)
  - Acquisition of fixed assets - not considered → (-) Inv.

- Relevant CF - Incremental
  - difference between the CF with the project and without the project
  - externalities (effects on other projects) - consider
  - opportunity costs - consider net market values
  - sunk costs - do not consider

P&L

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Organization of financial analysis

6. Financial Math

Fin. Math

1. Cost Determination
2. Estimated expected cash flows
3. Estimated risk of estimated cash flows
4. Determination of appropriate cost of capital
   - The cost of capital is higher for higher risk projects - it should reflect the cost of capital for a minimal risk investment, a risk premium, and inflation.
   - It should reflect the diversity and weight of the forms of financing: own (equity) or borrowed (debt)
   - http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/wacc.htm
5. Positive cash flow update
6. Comparison with cost: if higher, accept proeject

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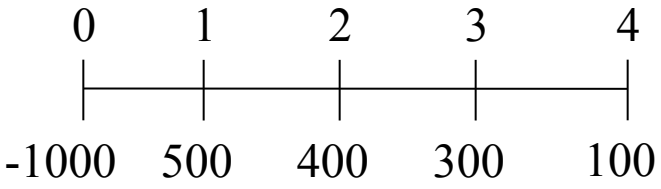
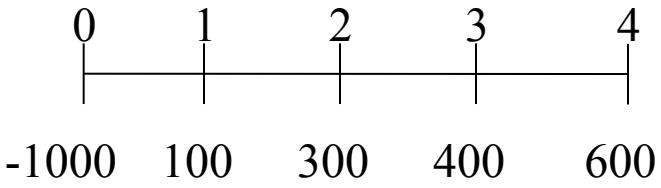
NPV (Net Present Value)

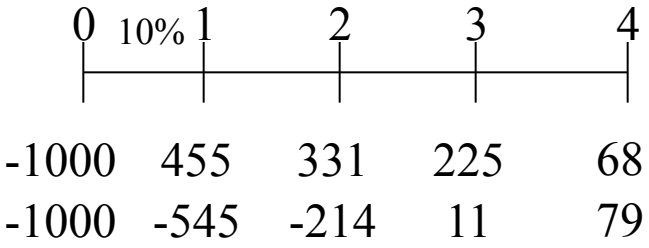
Project S



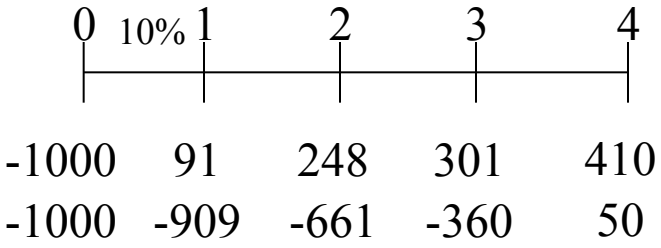
Project L



- Sum of discounted CF



€ 79



€ 50

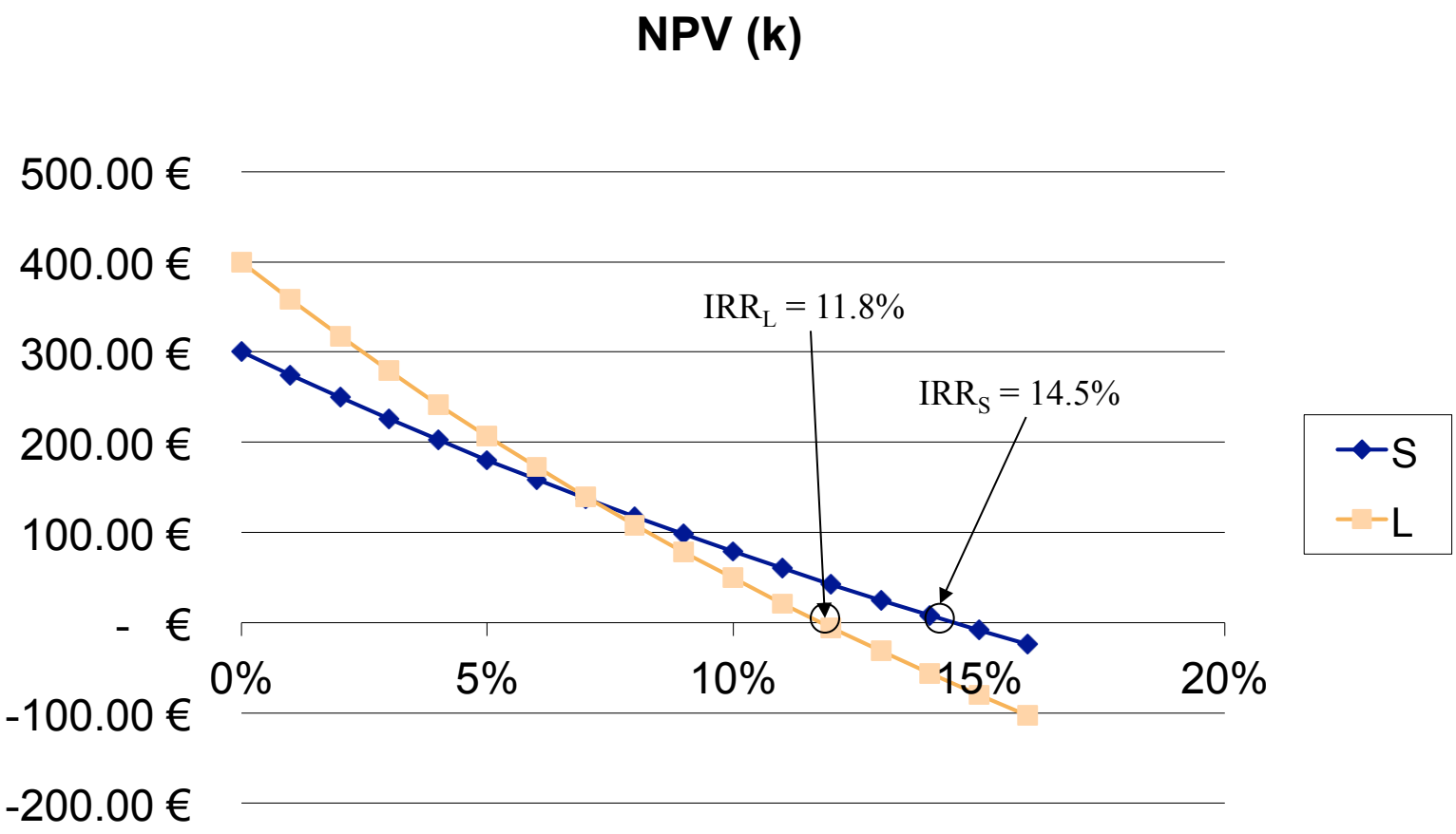
NPV (Net Present Value)

- NPV = 0 $$NPV = \sum_{t=0}^{n} CF_t \left(\frac{1}{1 + IRR} \right)^t = 0$$
  - Generated CF are exactly enough to pay for the capital invested and the required return
- NPV > 0
  - CF generate more than the required return

IRR (Internal Return Rate)

- IRR = k $$NPV = \sum_{t=0}^{n} CF_t \left(\frac{1}{1+IRR} \right)^t = 0$$
  - Generated CF are exactly enough to pay for the capital invested and the required return
- IRR > k
  - CF generate more than the required return

NPV vs IRR


NPV (k)
500.00 €
400.00 €
300.00 €
200.00 €
100.00 €
- €
-100.00 €
-200.00 €
0%
5%
10%
15%
20%
IRR$_L$ = 11.8%
IRR$_S$ = 14.5%
S
L

NPV vs IRR

- Independent Projects
  - NPV and IRR lead to the same decision
- Mutually exclusive projects
  - k> crossover rate - same decision
  - k <crossover rate - contrary decisions
- Conflicts
  - Scale differences (different costs)
  - Timing differences

NPV vs IRR

- Key question - what is the appropriate reinvestment rate?
  - with scale differences, for CFs that were not invested
  - with timing differences, for the CFs that are being generated
- Most correct assumption
  - reinvestment at cost of capital

mIRR

- mIRR (Modified IRR)
  - CIF Future Value - Cash In-Flows - Return (Positive)
  - Current value of COF - Cash Out Flows - Investment (negative)
  - mIIR expresses the annual rate of return that relates the present value of COF to the future value of CIF.

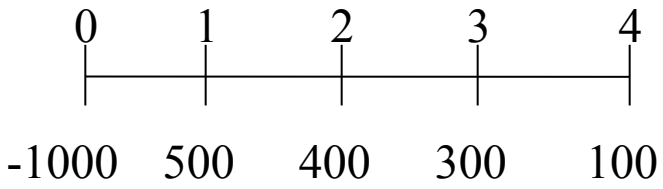
$$\sum_{t=0}^{n} \mathrm{CIF}_t \left(1+k\right)^{n-t} = \sum_{t=0}^{n} \mathrm{COF}_t \left(\frac{1}{1+k}\right)^{t} \left(1+\mathrm{mIRR}\right)^{n} \Leftrightarrow \mathrm{mIRR} = \left(\frac{\sum_{t=0}^{n} \mathrm{CIF}_t \left(1+k\right)^{n-t}}{\sum_{t=0}^{n} \mathrm{COF}_t \left(\frac{1}{1+k}\right)^{t}} \right)^{\frac{1}{n}} - 1$$

- NPV Superiority: Indicates how much each project contributes to the company value

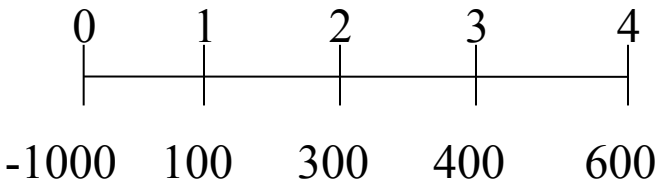
Decision rules

mIRR (k=5%)

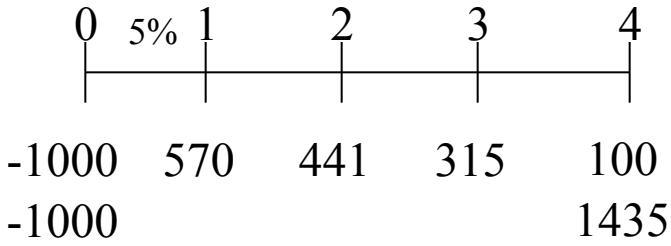
Project S



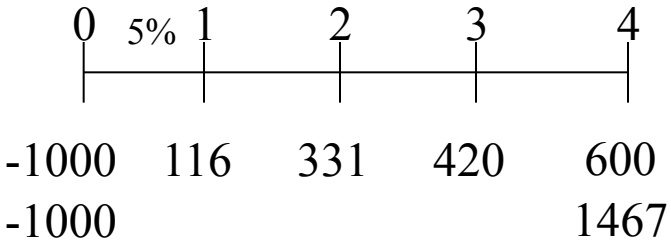
Project L



- CV of COF (CV_COF) and FV of CIF (FV_CIF)



mIRR=(1435/1000)^(1/4)-1=9.45%

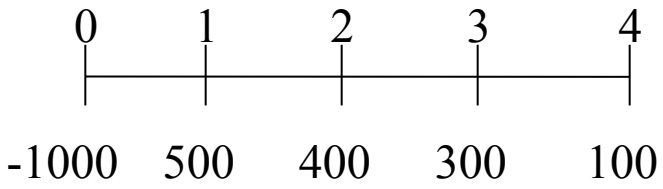


mIRR=(1467/1000)^(1/4)-1=10.05%

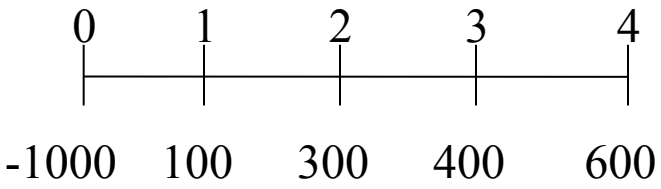
Decision rules

mIRR (k=10%)

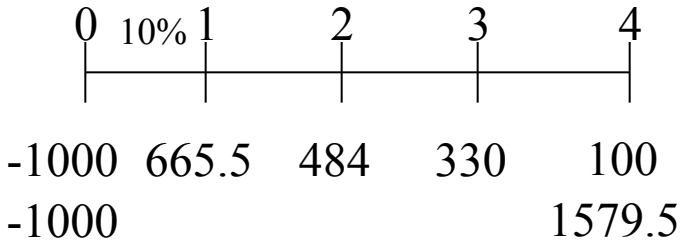
Project S



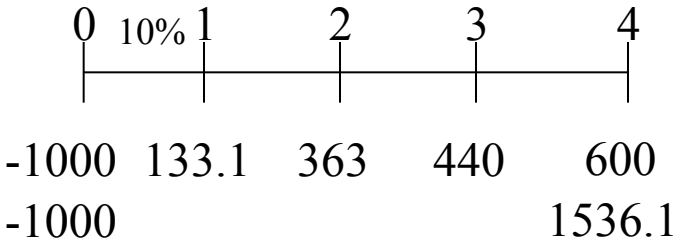
Project L



- CV of COF (CV_COF) and FV of CIF (FV_CIF)



mIRR =(1579,5/1000)^(1/4)-1=12.11%



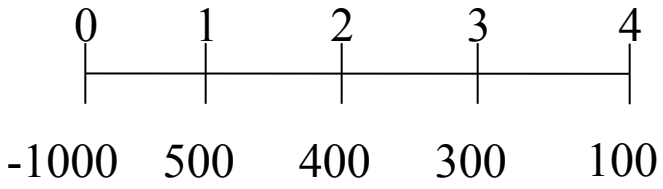
mIRR=(1536.1/1000)^(1/4)-1=11.33%

$IRR_S = 14.5\%$

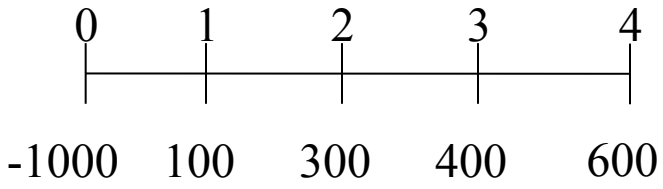
$IRR_L = 11.8\%$

Payback period

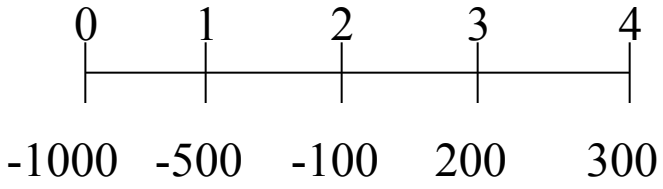
Project S



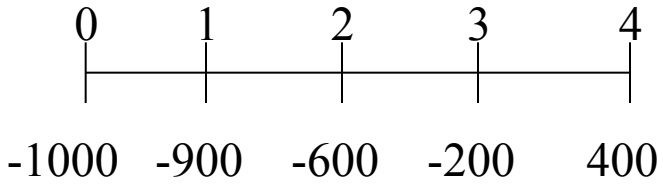
Project L



- With accumulated CF



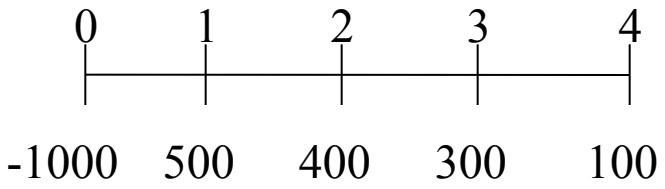
2.33 years



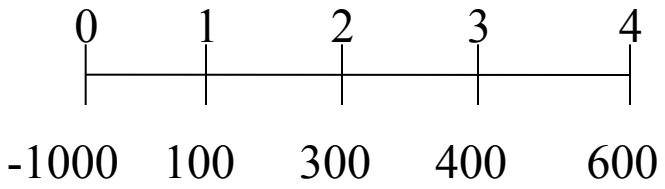
3.33 years

Payback period

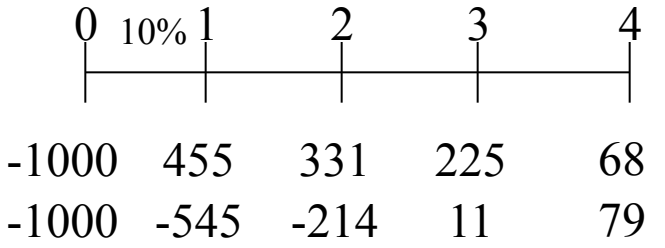
Project S



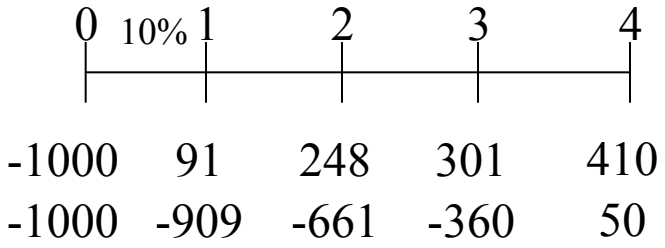
Projecto L



- With accumulated CF



2.95 years



3.88 years

Projects with different lifetimes

- Comparison at least common multiple of life spans
  - Assumes repetition of investments
- Equivalent annual income
  - income from a series of annual incomes of the same present value, lifetime and refresh rate as each project

Bibliography

- Brigham, E. F. e Capenski, L. C. – *Financial Management, Theory and Practice, 8th Edition* – The Dryden Press, 1997
- das Neves, João C. – *Análise Financeira, 15ª edição* – Texto Editora, 2004