Project Evaluation Methods (PEM)

Notebook of exercises – Chapter 1

Academic year 2023/ 24

Exercise 1

It is estimated that an investment project will receive net cash inflows at the end of each year of his economic life. They are 100€, 200€ and 600€. The appropriate discount rate is 3% per annum.

a) What is the present value of this project's cash inflows, to be received at the end of years 1, 2 and 3, respectively?

b) What is the present value of this project's cash inflows, to be received at the end of years 1, 3 and 6, respectively?

Answers to exercise 1

a) PV=€834,69. **b)** PV=€782,61.

Exercise 2

The project TECH requires an initial outlay of 2 million of euros and an upgrade outlay of 1500000€ for the start of year 2.

The project will have cash inflows of 3 million of euros in year 1, 4 million of euros in year 2 and 8 million of euros in year 3. The discount rate is 3% per annum.

a) According to the rule of the Net Present Value, determine the decision to take on the project TECH.

b) According to the rule of the Internal Rate of Return, determine the decision to take on the project TECH.

c) Repeat the exercise assuming that capital outlays have been changed to 9 million of euros and €5600000, respectively.

Answers to exercise 2

a) NPV=10547827,59€ (greater than zero), therefore the project should be accepted.

b) IRR=1,34 (greater than the required rate of return), therefore the project should be accepted.

c) NPV=–432754,93€ (lesser than zero), therefore the project should not be accepted.

IRR=0,014 (lesser than the required rate of return, 0,03), therefore the project should not be accepted.

Exercise 3

A Corporation is considering an investment proposal to expand one of its product lines. The economic life of the project is estimated to be 8 years. Capital outlay in the first year is 1 million of euros and, at the end of the year 3, another capital expenditure of €500000 is required for an upgrade. The series of cash inflows for the Project is tabulated below.

year (t)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Cash inflow at the end of year t (in euros)	175510	189087	205365	219643	244421	260760	255061	220362

The discount rate is 5% per annum.

a) Determine the NPV of the project and indicate whether project should be (or not be) accepted.

b) Determine the IRR of the project and indicate whether project should be (or not be) accepted.

Answers to exercise 3

a) NPV=–€18645,95 (less than zero), therefore the project should not be accepted.

b) IRR=0,0462 (less than the required rate of return), therefore the project should not be accepted.

Exercise 4

Consider again the project presented in exercise 3. But now, instead of net cash flows, are known the following characteristics of the project:

- The level of working capital for the project is tabulated below;

year (t)	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Working Capital (in euros)	2000	2500	3100	3600	4000	4300	4500	3000	0

- The salvage value of the total capital expenditure (€1.5 million) at the end of the eighth year is estimated as €16000;

- The depreciation rate for the initial investment, for tax purposes, is 12.5% per annum; the upgrade depreciates at €100000 per year for years 4 to 8;

– The forecast sales for the project are tabulated below;

year (t)	1	2	3	4	5	6	7	8
Forecast Sales Units	691106	707812	724518	1241224	1257931	1274637	1291343	1308049

– The selling price of the product is expected to be 50 cents per unit for the first five years, and 75 cents thereafter;

– The production cost is estimated to be 10 cents per unit;

– Other operating costs (which do not include depreciation) are €50000 per year for the first five years and €55000 per year for the rest of the project life;

– The corporate tax rate is 30%.

a) Determine the NPV of the project and indicate whether project should be (or not be) accepted.

b) Determine the IRR of the project and indicate whether project should be (or not be) accepted.

Answers to exercise 4

a) NPV=€1049851,97 (greater than zero), therefore the project should be accepted.

b) IRR=0,1980 (greater than the required rate of return), therefore the project should be accepted.

Exercise 5

An airline company is planning to introduce a new country run, to provide two return services a week (104 services per year) to a rural city with a population of 30000 persons. The airline will use a forty-passenger aircraft, which it can purchase for 4.5 million euros. An airstrip owned by the local government in the rural area is available without charge, but the company will have to carry out restoration of the disused airstrip and terminal at a cost of €200000.

In order to develop the financial model, the company collected the relevant information about the project:

- Initially, the demand of passengers is estimated at 5000 passengers per year (one-way flights), increasing at a rate of 300 per year.
- In addition to passenger services, the company has a contract to transport mail to the rural city for a fixed annual payment of €200000.
- The cost of fuel in each year is estimated at € 800 per flight, plus €10 per passenger.

- The fixed costs in each year are divided into
  - annual cost of the airscrew, which is estimated at €200000;
  - annual cost of the ground staff, which is estimated at €50000; and
  - annual maintenance cost for the aircraft, which is estimated at 7% of the initial price.
- The cost of booking and other services is €15 per passenger flight.

- The price of one-way airline ticket is €280 (thus, the purchase of a round trip ticket costs €560).
- The appropriate discount rate is 8%.
- Company tax is 30% of the annual operating surplus.
- The aircraft and ground facilities can be depreciated at a rate of 10% per annum for taxation purposes.
- After ten years, the aircraft has a salvage value of 1 million of euros.

a) Determine the expression of the net cash flow in each year.

b) Determine the NPV of the project and indicate whether project should be (or not be) accepted.

Answers to exercise 5

a) Net cash flow in year t=0,…,10: Total gross Revenue in year t – Capital outlay in year t – Total operational cost in year t – Tax Payable in year t + Salvage value in year t;

Tax Payable in year t=0,…,10: Total gross Revenue in year t – Total operational cost in year t – Margin of depreciation in year t + Salvage value in year t.

b) NPV=€2532788,53 (greater than zero), therefore the project should be accepted.