

Objectives of Investment Appraisal

First Objective

To ensure that project is worthwhile *i.e.* future benefits justify expenditure

Second Objective

To identify the best option for deriving the future benefits, and assurance of most effective use of resources

In short

- it ensures that the right project is undertaken at the right time and in a way which gives it the best chance of success
- Appraisal provides information for making good investment decisions

Investment Appraisal

Why invest?

Plan and allocate the long-term use of valuable or scarce resources and to ensure survival and continuing prosperity of the company

Investment projects

- require expenditure of current wealth and other resources with the expectation of generating future benefits
- worthwhile investment = favorable returns
- investment appraisal compares resources needed with expected benefits

Investment Appraisal and the Biotechnologist

Biotechnologists

- provide information upon which the economic evaluation is made by others
- or may be responsible for making the investment decision

Therefore

they should be fully aware of the whole process in order

- to be able to contribute effectively
- to understand how projects arise

Project Evaluation

Appraisal of factors which are

- quantifiable, measurable and comparable in money terms

There are other aspects which might also be appraised

Staged and recurring nature of evaluation

Evaluation may be carried out several times at different stages a project's life from initial research to the final go/no-go decision on building the full-scale plant

Project Evaluation 2

Based on forecasts or estimates of the

monetary costs and timing of the effort and resources

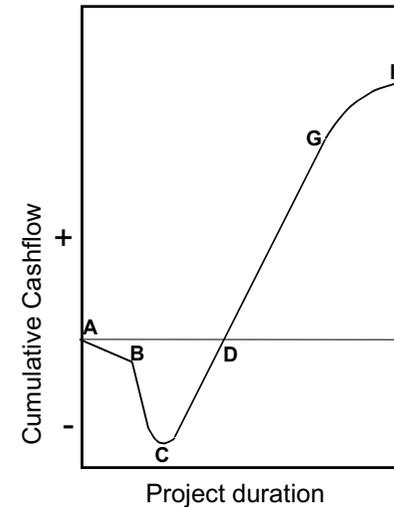
and the

monetary value and timing of the resulting benefits.

Cumulative cash flow in a project

The typical plot of cumulative cash flow against time in a project made be accurately obtained from records of a project at project end

The Cumulative Cash Flow Diagram



- A - B: development, design and other preliminary activities
- C: max. debt accumulated by project; *construction of plant*
- D: Break even point
- G: Rate of positive flow decreases *due to things like increased maintenance costs or fall in market price*
- H: Plateau; no further cash flows. *Salvage value of plant will show up as a final flow at this point*

The Cumulative Cash Flow Diagram 2

- the data is historical. It would be useless for decision making as the data is historical
- Project evaluation is concerned with analysis of the economic consequences of investment decisions *before* they are made *i.e.* future cash flows

Economic evaluation is based on estimates

Since the cash flows are in the future, they are expressed as estimates which are subject to varying degrees of uncertainty.

Measures of Profitability

Non-Discounting

- Payback period
- Return on Investment

Discounting

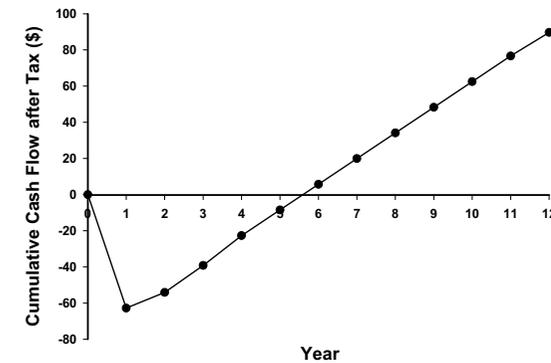
- Net Present Value
- Internal Rate of Return (Discounted Cash Flow Rate of Return)

Cumulative Cash Flow

Consider

Year	Cash Flow After Tax (\$ million)	Cumulative Cash Flow After Tax (\$ million)
1	-62.8	-62.8
2	8.7	-54.1
3	14.9	-39.2
4	16.5	-22.7
5	14.2	-8.5
6	14.2	5.7
7	14.2	19.9
8	14.2	34.1
9	14.2	48.3
10	14.2	62.5
11	14.2	76.7
12	13.0	89.7

Cumulative cash flow diagram



Payback Period

A measure of the time needed for the cumulative project investment to be exactly balanced by the cumulative net income.

Advantages

- useful where long term cash flows are difficult to forecast.
- often used in preliminary evaluation for risky projects in times of uncertainty.
- a rule of thumb method used in early stages of evaluation, saving the effort of trying to make long term cash flow projections.

Disadvantages

- provides no indication of no indication of the expected return on investment or cash return of a project.
- Ignores everything in the time beyond the breakeven point.
- Ignores the changing pattern of cash flow with time.
- Ignores the time value of money.

Return on Investment (ROI)

A measure of the per cent ratio of average yearly profit (net cash inflow) over the productive life of the project, divided by the total initial investment.

Disadvantages

- Ignores the time value of money.
- Ignores the changing pattern of cash flow with time.

The Time Value of Money

- Not the same as inflation.
- Future incomes are discounted to take account of the time value of money.
- In economic evaluation, the projected cash flows occur over an extended time.
Discounting brings them to a common time (the present) basis for comparison.
Discounting gives the Net Present Value.

Net Present Value (NPV)

A measure of absolute economic profit expected as the result of investing in a project.
The net value of all cash flows for the project, from commencement of capital expenditure to completion of economic life.

Advantages

- Accounts for the time value of money (using discounting).
- Accounts for the change in cash flow pattern with time.

Internal Rate of Return (IRR)

also known as **Discounted Cash Flow Rate of Return (DCFR)**

A measure of the efficiency with which capital is employed and provides an indication of the earning power of the investment in the project.

Is the percent value of the yearly discount rate which equates the project NPV to zero.

The Relationship Between NPV and IRR

