Alternatives

Chapter 3

Economic Evaluation of Alternatives

Bases for Comparison of Alternatives

- There are several bases for comparing the worthiness of the projects. These bases are:

  i. Present worth method

  ii. Future worth method

  iii. Annual equivalent method

  iv. Rate of return method

Bases for Comparison of Alternatives

Present worth method:

In this method of comparison the cash flows of each alternatives will be reduced to time zero by assuming an interest rate i. then depending on the type of the decision the best alternatives will be selected by comparing the present worth of both the alternatives.

Two methods in calculating the present worth:

- Cost dominated cash flow diagram

- Revenue dominated cash flow diagram
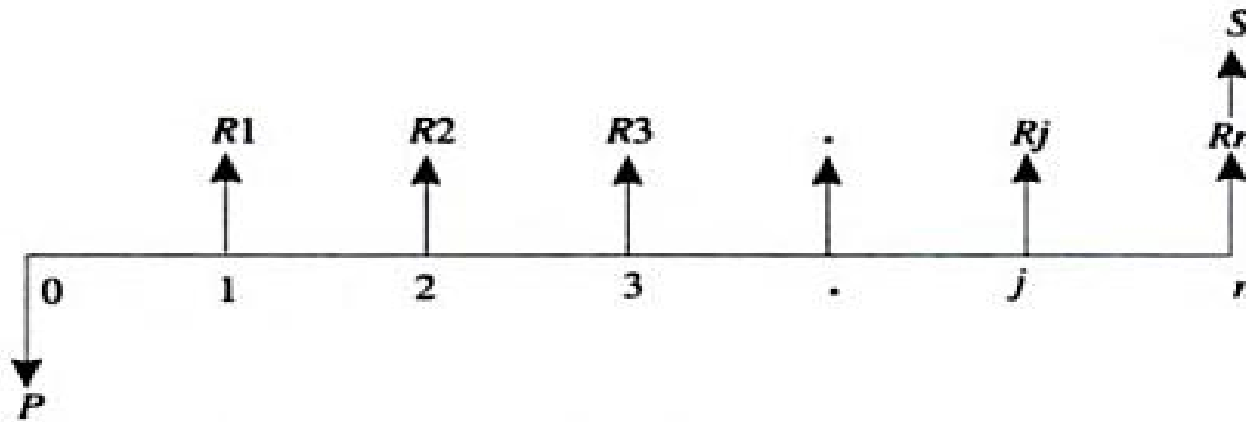
Bases for Comparison of Alternatives

- **_Cost dominated cash flow diagram:_**

    In the cost dominated cash flow diagram, the costs (out flows) will be assigned with a positive sign and the profits, revenue and salvage value (inflows) will be assigned with negative sign.

- **_Revenue dominated cash flow diagram:_**

    In a revenue/ profit dominated cash flow diagram, the profit, the revenue salvage value (all inflow to an organization) will be assigned with a positive sign. The costs (outflows) will be assigned with negative sign.

To compute the present worth amount of the above cash flow diagram for a given interest rate i,

$$PW(i) = -P + R1[1/(1 + i)^1] + R2[1/(1 + i)^2] + \ldots$$
$$+ Rj[1/(1 + i)^j] + Rn[1/(1 + i)^n] + S[1/(1 + i)^n]$$

In the above formula, expenditure is taken as negative sign and revenue as positive. The alternative with maximum present worth amount should be selected as the best alternative.

Bases for Comparison of Alternatives

- **Revenue dominated cash flow diagram:**
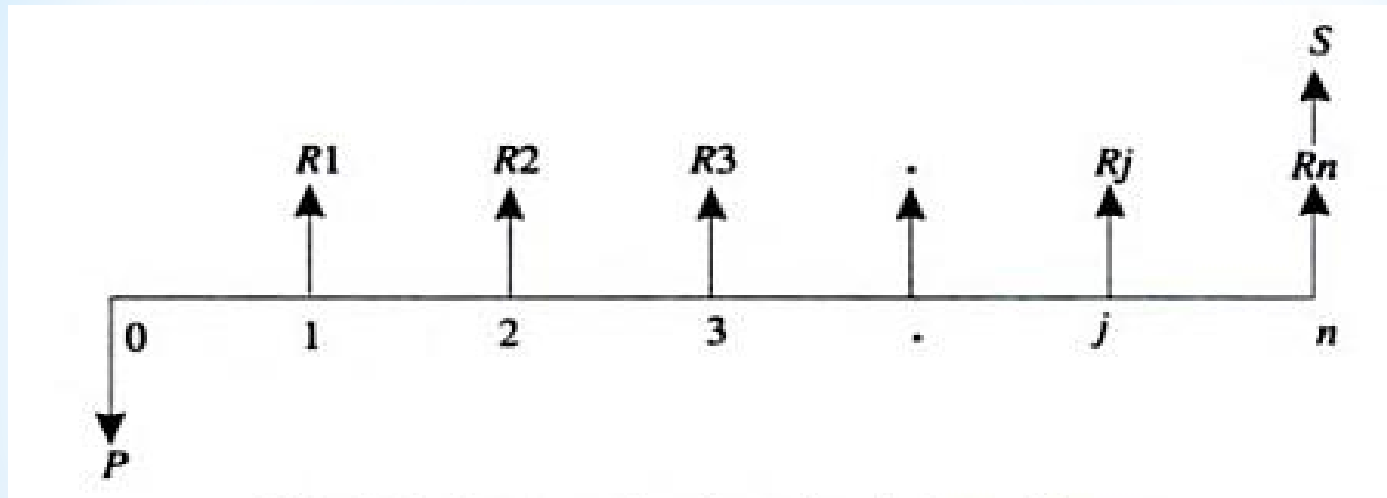
Where,

P – Represents initial investment

Rj – Net revenue at the end of jth year.

S – Represent the salvage value at the end of nth year

1. A finance company invites public to invest in their 2 investments schemes. In scheme1,the company pays Rs.100000 after 12yrs for an investment of Rs.10000 now. In scheme2, for the same initial investment the company would pay Rs.25000 at the end of 5th year, another Rs.25,000 at the end of 10th yr . and Rs.25000 at the end of 12th yr from now. if you would like to invest in the company , which scheme would you go for rate of interest assured is12%, compounded annually?

*A machine tool company is considering acquiring a new metal cutting machine. The required intial investment is $76,000. the cash flows are as follows. Evaluate the economic feasibility at 12%

n	cash flow
0	-76,000
1	35,560
2	37,360
3	31,850
4	34,400

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2. A xerox machine in a new locality with an initial outlay of Rs.1,00,000 yields Rs.80,000 during 1st year of its operation and the yield increases by Rs.10,000 from its 2nd year of its operation, for a period of 8years. At the end of life of business, the machine becomes scrap and has zero salvage value. Find the present worth of the business assuming a rate of interest of 12%, compounded annually. Comment on the feasibility.

Numerical

1. A building contractor has 2bids for a refrigeration system to be employed. The details are as follows: i=12%

Bidder	Initial cost (Rs)	Annual operations & maintenance cost (Rs)	Service life in years
Carrier A/c	9,00,000	40,000	20
Godrej	8,50,000	45,000	20

*1.* A company needs a mini-bus. It has 2 alternatives:

1) To rent a vehicle for a payment of Rs.3 lakhs per year for the next 5years.

2) To buy a second hand vehicle for Rs.3lakhs with an operating and maintenance cost of Rs.2lakhs per year. Salvage value of the vehicle after 5 years would be about 1 lakh.

Select the best alternative based on the present worth method of comparison using an interest rate of 12% compounded annually.

Cost dominated cash flow diagram:

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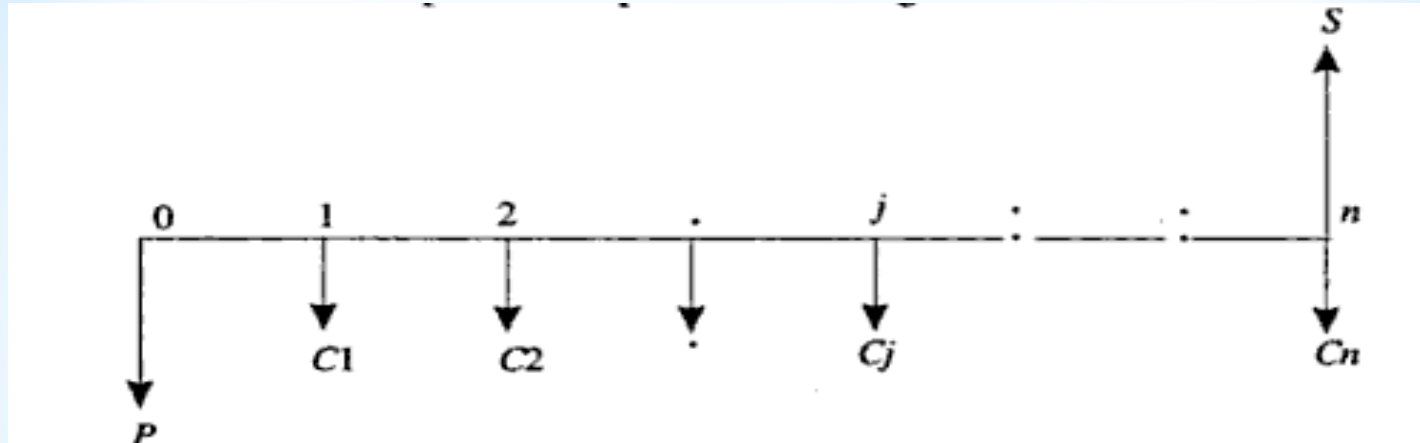
To compute the present worth amount of the above cash flow diagram for a given interest rate i,

$$PW(i) = P + C1[1/(1 + i)^1] + C2[1/(1 + i)^2] + \dots + Cj[1/(1 + i)^j]$$
$$+ Cn[1/(1 + i)^n] - S[1/(1 + i)^n]$$

In the above formula, expenditure is taken as positive sign and revenue as negative. The alternative with minimum present worth amount should be selected as the best alternative.

2. Your firm is considering purchasing an old office building with an estimated remaining service life of 25years. Recently, your tenants have signed long term leases which leads you to believe that the current rental income of $2,50,000 per year will remain constant for the first 5years. This will then increase by 10% over the remaining life of the asset for every 5years. The operating expenses including income taxes, will be $85,000 for the first year and then they will increase by $5,000 each year thereafter. The razing the building and selling the lot on which it stands will realize an amount of $50,000 at the end of 25years. if you had an opportunity of investing this money elsewhere at 12%PA, what would be the maximum amount you would be willing to pay for the building now?

Assets having unequal lives

1. Assets A1 and A2 have the capability of satisfactorily performing a required function. Asset A2 has an initial cost of Rs.32,000 and an expected salvage value of Rs.4000 at the end of its 4year service life. Asset A1 costs Rs.9000 less initially, with an economic life 1 year shorter than that of A2; but A1 has no salvage value, and its annual operating costs exceed those of A2 by Rs.2500. when its required rate of return is 15% state which is preferred when comparison is by.

- LCM method (the repeated-projects method)

- Study period method for 2 years

Problem

2. Two types of trucks are available for transportation use. The details are as given in table:

Costs	Truck A	Truck B
First cost (Rs)	10,00,000	15,00,000
Annual operating cost (Rs)	20,000	15,000
Life (Yrs)	5	10
Salvage Value (Rs)	2,00,000	5,00,000

Both the truck deliver same amount of work. Assume interest rate of 7%, which truck is to be preferred on Present worth basis.

*A local car dealer is advertising a standard 24-month lease plan of $1,150 per month for its new car. Standard lease plan requires a down payment of $4,500 plus $1,000 refundable initial amount now. Another plan offers a single up-front payment of $30,000 + $1,000 initial deposit now. The initial deposit will be refunded at the end of month – 24. At 6%, compounded quarterly, which is preferred?

3. The details of feasibility report of a project are shown below. Check the feasibility of the project based on present worth if i=20%.

o Initial outlay:Rs.5000000

o Life of Project : 20 years

o Annual revenue: Rs.1500000

o Modernizing cost at the end of 10th year: Rs.2000000

o Salvage Value: Rs.500000

4) A new rock pit will be operated for a construction project that will last 5 years.

Rock can be loaded from an elevated box loader served by a conveyor from the pit or by mobile shovel loaders. The box loader and conveyor have an initial cost of Rs.2,64,000 and will have no salvage value at the end of the project.

Two shovel loaders each priced Rs.42,000 can provide the same capacity, but their operating costs together will be Rs.36,000 per year more than the box loader. Normal service life for a shovel loader is 3 years with zero salvage value, but a 2 year old machine can likely be sold for Rs.10,000.

Which alternative is preferred when the interest rate is 12%?

* Three types of products can be used in a certain operation.

- The First product will cost $3500 to buy and will last for 3 months under the conditions in which they will be used. The operating cost will be $2000 per month and salvage value is $2000.

- The 2nd **product** will cost $6500 to buy and will last for 6 months with an operating cost of $1500 per month and salvage value is $4000.

- The 3rd **product** will cost $7000 to buy and will last 12 months with an operating cost of $1200 per month with salvage value $3000.

 At an interest rate of 12% per year, compounded monthly, which type of product should be used on the basis of Present Worth analysis?

* Telefono Mexico is expanding its facilities to serve a new manufacturing plant. The new plant will require 2000 telephone lines this year, and another 2000 lines after expansion in 10 years. The plant will be in operation for 30 years. The telephone company is evaluating two options to serve the demand.

* Option 1 Provide one cable now with capacity to serve 4000 lines. The cable cost will be $200,000, and annual maintenance costs will be $15,000.

* Option 2 Provide a cable with capacity to serve 2000 lines now and a second cable to serve the other 2000 lines in 10 years. The cost of each cable will be $150,000, and each cable will have an annual maintenance of $10,000.

* The telephone cables will last at least 30 years, and the cost of removing the cables is offset by their salvage value. Which alternative should be selected based on a 10% interest rate?

*A remotely located air sampling station can be powered by solar cells or by running an electric line to the site and using conventional power. Solar cells will cost $12,600 to install and will have a useful life of 4 years with no salvage value. Annual costs for inspection, cleaning, etc., are expected to be $1400. A new power line will cost $11,000 to install with 3 years service life, with power costs expected to be $800 per year. The salvage value of the lines are considered to be zero. At an interest rate of 10% per year, which alternative should be selected on the basis of a future worth analysis?

*Two processes can be used for producing a polymer that reduces friction loss in engines. Process K will have a first cost of $160,000, an operating cost of $7000 per quarter, and a salvage value of $40,000 after its 2-year life. Process L will have a first cost of $210,000, an operating cost of $5000 per quarter, and a $26,000 salvage value after its 4-year life. Which process should be selected on the basis of a present worth analysis at an interest rate of 8% per year, compounded quarterly?