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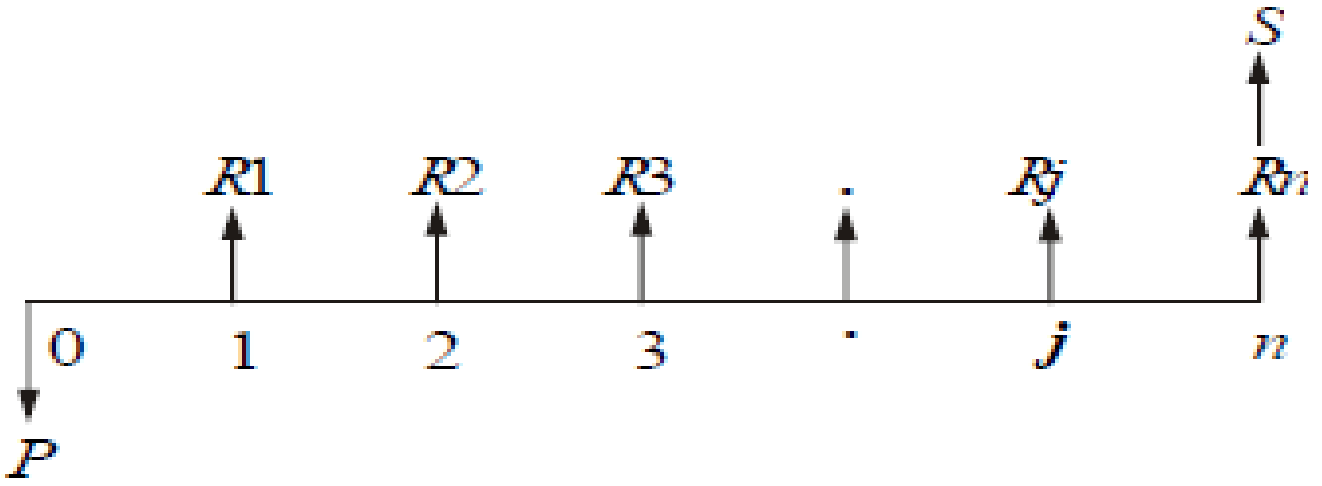
Chapter 7

RATE OF RETURN METHOD

Rate of Return Method

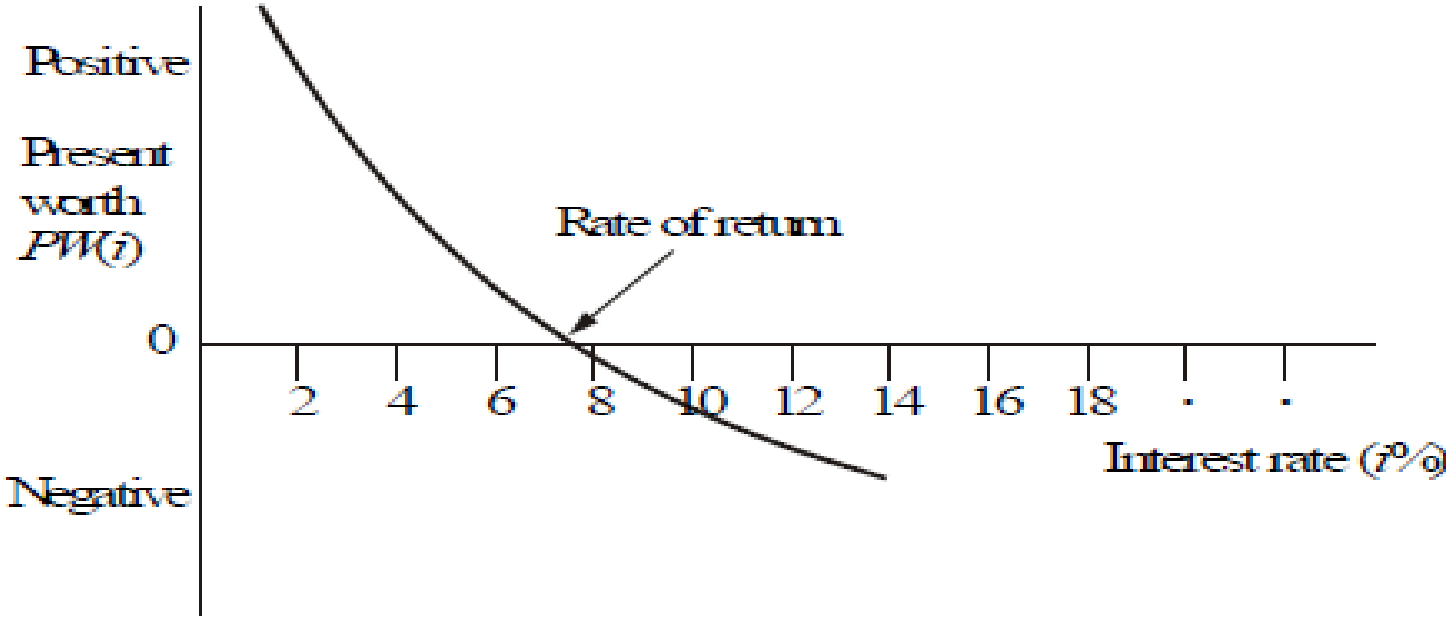
- The rate of return of a cash flow pattern is the interest rate at which the present worth of that cash flow pattern reduces to zero.
- In this method of comparison, the rate of return for each alternative is computed.
- Then the alternative which has the highest rate of return is selected as the best alternative.
- In this type of analysis, the expenditures are always assigned with a negative sign and the revenues/inflows are assigned with a positive sign.

- A generalized cash flow diagram to demonstrate the rate of return method of comparison is presented in the Figure:



- The first step is to find the net present worth of the cash flow diagram using the following expression at a given interest rate, *i*.

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



- So, one has to start with an innate value of *i and check whether the* present worth function is positive. If so, increase the value of *i until PW(i)* becomes negative.
- Then, the rate of return is determined by interpolation method in the range of values of *i for which the sign of the present worth* function changes from positive to negative.

Interpolation method formula

$$IRR = r_a + \frac{NPV_a}{NPV_a - NPV_b}(r_b - r_a)$$

r_a = lower discount rate chosen

r_b = higher discount rate chosen

N_a = NPV at r_a

N_b = NPV at r_b

Example 1

- A person is planning a new business. The initial outlay and cash flow pattern for the new business are as listed below. The expected life of the business is five years. Find the rate of return for the new business.

Period	0	1	2	3	4	5
Cash flow (Rs.)	–1,00,000	30,000	30,000	30,000	30,000	30,000

Example 7.1

The Present worth Funcation For business is

$$PW(i) = -1,00,000 + 30,000 \left(\frac{(1+i)^n - 1}{i(1+i)^n}\right)$$

$\Rightarrow$ When $i = 10\%$

$$PW(10\%) = -1,00,000 + 30,000 \left(\frac{(1+0.1)^5 - 1}{0.1(1+0.1)^5}\right)$$

$$= -100,000 + 30,000 \ (3.7908)$$

$$= Rs.\ 13,724$$

$\Rightarrow$ when $i = 15\%$

$$PW(15\%) = -1,00,000 + 30,000 \left(\frac{(1+0.15)^5 - 1}{0.15(1+0.15)^5}\right)$$

$$= -100000 + 30,000 \ (3.3522)$$

$$= Rs\ 566$$

$\Rightarrow$ when $i = 18\%$

$$PW(18\%) = -100000 + 30000\left(\frac{(1+0.18)^5 - 1}{0.18(1+0.18)^5}\right)$$

$$= -100000 + 30000\,(3.1272)$$

$$= -6,184$$

$$(i) = 15\% + \frac{566 - 0}{566 - (-6184)} \times (3\%)$$

$$= 15\% + 0.252\%$$

$$= \boxed{15.252\%}$$

The rate of return for the new business is 15.252

Example 2

- A company is trying to diversify its business in a new product line. The life of the project is 10 years with no salvage value at the end of its life. The initial outlay of the project is Rs. 20,00,000. The annual net profit is Rs. 3,50,000. Find the rate of return for the new business.

7.2

The Formula for the net Present worth Function of the situation is

$$PW(i) = -2000000 + 350000 \left(\frac{(1+i)^5 - 1}{i(1+i)^5}\right)$$

⇒ when $i = 10\%$

$$PW(10\%) = -20,00,000 + 350000 \left(\frac{(1+0.1)^{10} - 1}{0.1(1+0.1)^{10}}\right)$$

$$= -20,00,000 + 350000\,(6.1446)$$

$$= RS\ 150,610$$

⇒ when $i = 12\%$

$$PW(12\%) = -20,00,000 + 350000 \left(\frac{(1+0.12)^{10} - 1}{0.12(1+0.12)^{10}}\right)$$

$$= -20,00,000 + 350000\,(5.6502)$$

$$= -22430$$

$$i = 10\% + \frac{150610 - 0}{1,50,610 - (-22430)} \times (2\%)$$

$$= 11.74\%$$

Therefore the rate of return of the new Product line is 11.74%