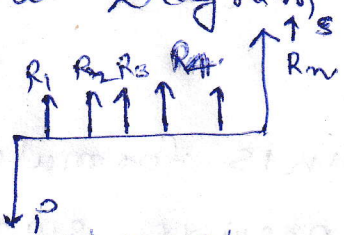
* Future Worth Method

→ Revenue dominated Cash flow Diagram



In above fig:-

- P Represent an initial investment.
- R_j The net revenue at the end of the Jth year an
- S the salvage value of the end of the nth year.

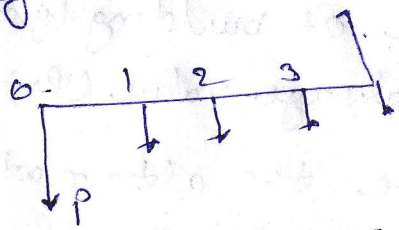
The formula for the future worth of the above Cash flow diagram for a given investment rate i is.

$$f(w)_i = P(1+i)^n + R1(1+i)^{n-1} + R2(1+i)^{n-2} + \text{———} + R_j(1+i)^{n-j} + \text{——} Rn+S$$

- In the above formula the expenditure is assigned with negative sign and the revenue are assigned with positive sign.
- finally the alternative with maximum future worth.

* Cost dominated Cash flow diagram

A generalized cost dominated cash flow diagram to denominstrate the future worth method of Comparision is given in fig:-



→ P Represent an initial investment C_j the net Cost of operation and maintenance at the end of the jth year and S the salvage value at the end of the nth year.

→ The formula for the future worth of the above cash flow diagram for a given interest rate i is.

$$f(W)(i) = P(1+i)^n + PC_1(1+i)^{n-1} + PC_2(1+i)^{n-2} + \cdots + PC_J(1+i)^{n-J} + \cdots + C_n - S.$$

→ In this formula the expenditure are assigned with positive sign and revenue with negative sign.

→ finally the alternative with the minimum future worth amount should be selected at the best alternative.

Ex 1 → A man own a corner plot. He must decide which of the several alternative to select in trying to obtain a desirable return on his investment. After much study and calculation, he decided that the two best alternative are as given in the following table.

for 20 year.

	Build gas station.	Build soft ice-cream stand
first Cost (Rs)	20,00,000	36,00,000
Annual property tax	80,000	1,50,000
Annual income (Rs)	8,00,000	9,80,000
life of building (year)	20	20
Salvage value (Rs)	0	0 ~~for 20 year~~

Evaluate the alternatives based on the future worth method $i = 12\%$.

$$f(W)(i) = P(1+i)^n + C_1(1+i)^{n-1} + C_2(1+i)^{n-2} + \cdots + C_J(1+i)^{n-J} + C_S + S$$

$$f(W)(i) = 200000\left(1+\frac{12}{100}\right)^{20} + 80000\left(1+\frac{12}{100}\right)^{19} + 8,00,000\cdot\left(1+\frac{12}{100}\right)^{18} + 20\left(1+\frac{12}{100}\right)^{0} - 0$$

$$S_n = \frac{a(r^n - 1)}{r - 1} \quad r \geq 1$$

$$fw(i) = 200{,}000 \cdot (1.12)^{20} + 80000(1.12)^{19} + 80000(1.12)^{18}$$

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* Alternative :- Build gas station

fixed cost : Rs 20,00,000

Net annual income = Annual income − Annual property tax

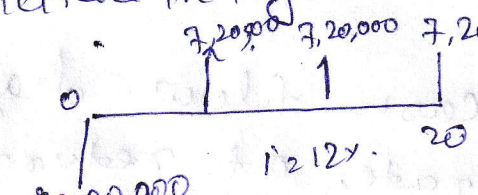
= 80,0000 − 80000

= 720000

life : 20 yr

Interest rate = 12% Compound annually

The cash flow diagram for this alternative is depicted in fig.



$$f = -20{,}00{,}000 \cdot (1.12)^{20} + 7{,}20{,}000(1.12)^{19} + 7{,}20{,}000(1.12)^{18} + \cdots + (1.12)^{0}$$

$$fw(12\%) = -20{,}00{,}000(1+0.12)^{20} + 7{,}20{,}000(1+0.12)^{19} \cdots$$

$$= 20{,}00{,}000(9.646) + 7\,20{,}000(72.052)$$

$$= \text{Rs } 32.5\,85\,440$$

$$= 36{,}00{,}000(1+0.12)^{20} + 8 \cdot 30{,}000\{(1.12)^{19} + \cdots (1.12)^{0}\}$$

$$= -36{,}00{,}000(9.646) + 8{,}30000(72.052)$$

$$= -34728600 + 59{,}803.160)$$

$$= 25{,}077.560$$

IRR Method

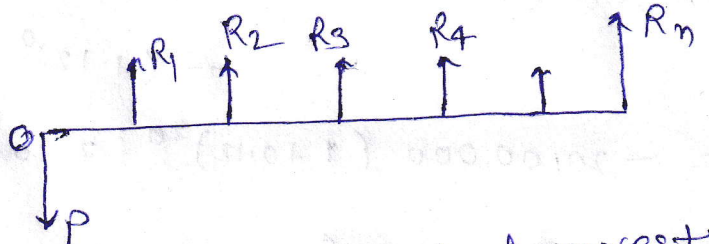
→ The Internal rate of return (IRR.) of a cash flow pattern is the interest rate at which the Present Worth of that Cash flow pattern reduces to zero.

→ In this method of comparision the rate of return for each alternative is ~~Compared~~ Computed.

→ Then the alternative which has the highest rate of return is selected as the best alternative.

→ In this type of analysis the expenditure are always assigned with a negative sign and the revenue / inflows are assigned with a Positive Sign.

→ A Generalized cash flow diagram to demonstrate the rate of return method of Comparision is Presented in fig.



→ P. Represent initial investment

R_j = The Net Revenue at the end of the j^{th} year and S the Salvage value at the end of the n^{th} year.