PRESENT WORTH METHOD OF COMPARISON

4.2 REVENUE-DOMINATED CASH FLOW DIAGRAM

A generalized revenue-dominated cash flow diagram to demonstrate the present worth method of comparison is presented in Fig. 4.1.

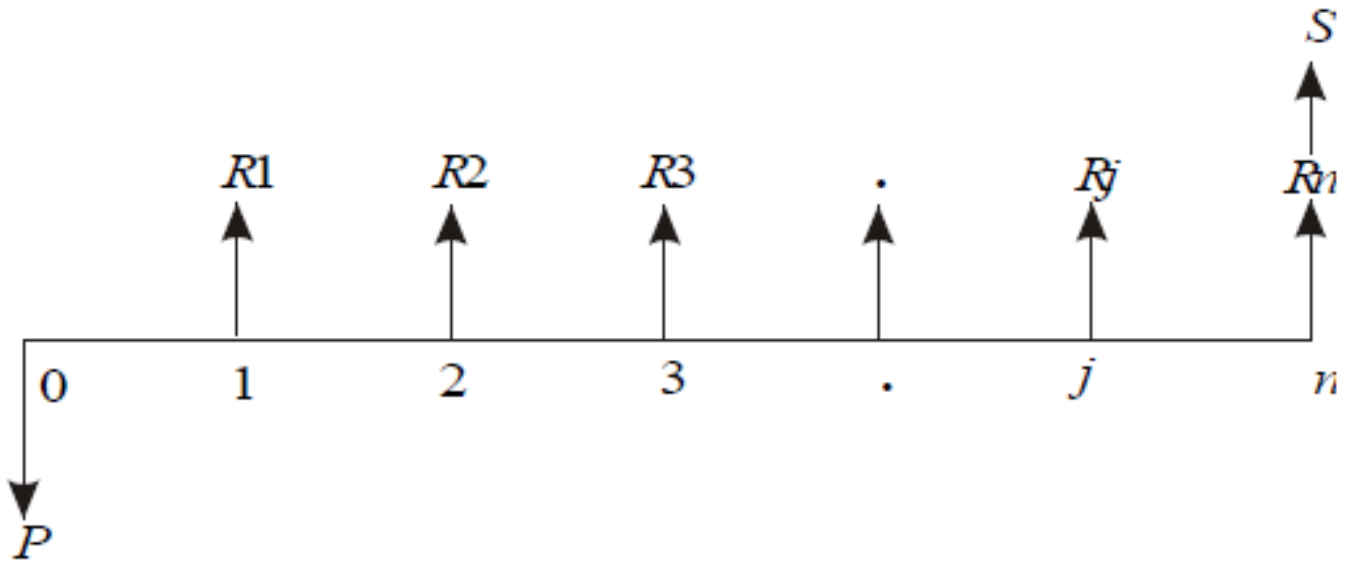

Fig. 4.1 Revenue-dominated cash flow diagram.

In Fig. 4.1, P represents an initial investment and Rj the net revenue at the end of the jth year. The interest rate is i, compounded annually. S is the salvage value at the end of the nth year.

To find the present worth of the above cash flow diagram for a given interest rate, the formula is

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

In this formula, expenditure is assigned a negative sign and revenues are assigned a positive sign.

If we have some more alternatives which are to be compared with this alternative, then the corresponding present worth amounts are to be computed and compared. Finally, the alternative with the maximum present worth amount should be selected as the best alternative.

4.3 COST-DOMINATED CASH FLOW DIAGRAM

A generalized cost-dominated cash flow diagram to demonstrate the present worth method of comparison is presented in Fig. 4.2.

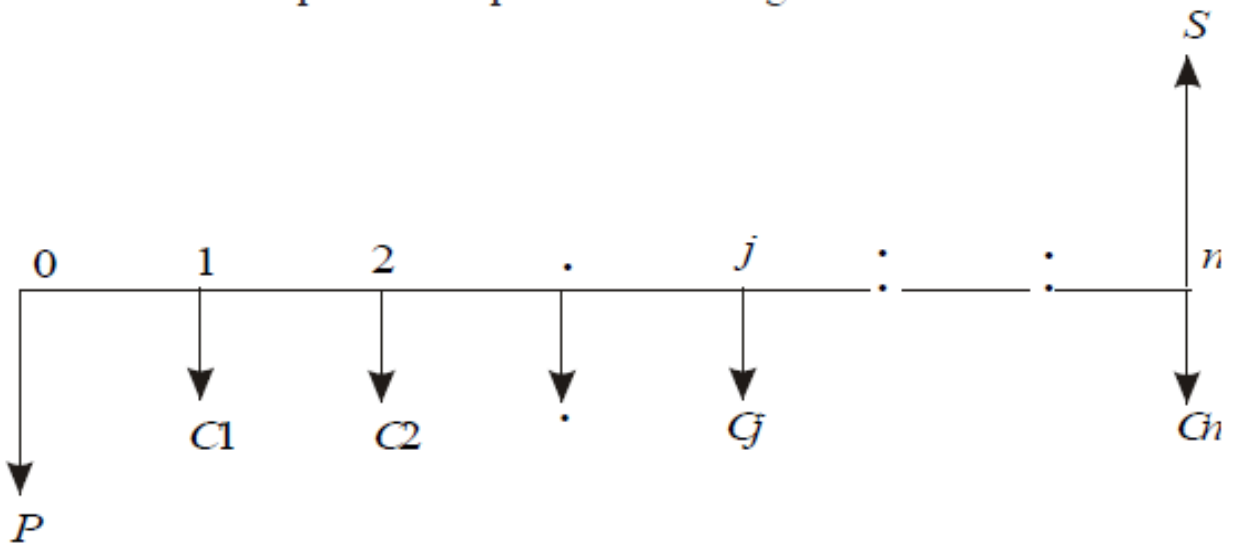

Fig. 4.2 Cost-dominated cash flow diagram.

In Fig. 4.2, P represents an initial investment, Cj 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.

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

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

In the above formula, the expenditure is assigned a positive sign and the revenue a negative sign. If we have some more alternatives which are to be compared with this alternative, then the corresponding present worth amounts are to be computed and compared. Finally, the alternative with the minimum present worth amount should be selected as the best alternative.

EXAMPLE 4.1 Alpha Industry is planning to expand its production operation. It has identified three different technologies for meeting the goal. The initial outlay and annual revenues with respect to each of the technologies are summarized in Table 4.1. Suggest the best technology which is to be implemented based on the present worth method of comparison assuming 20% interest rate, compounded annually.

Table 4.1

	Initial outlay (Rs.)	*Annual revenue* (Rs.)	*Life* (years)
Technology 1	12,00,000	4,00,000	10
Technology 2	20,00,000	6,00,000	10
Technology 3	18,00,000	5,00,000	10

Solution In all the technologies, the initial outlay is assigned a negative sign and the annual revenues are assigned a positive sign.

TECHNOLOGY 1

Initial outlay, P = Rs. 12,00,000
Annual revenue, A = Rs. 4,00,000
Interest rate, i = 20%, compounded annually
Life of this technology, n = 10 years

The cash flow diagram of this technology is as shown in Fig. 4.3.

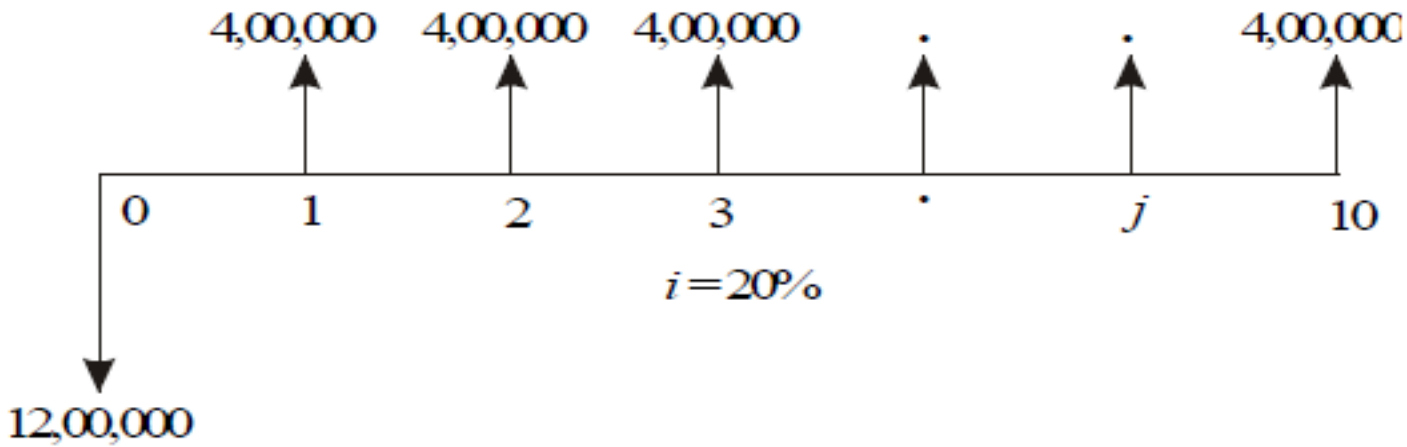

Fig. 4.3 Cash flow diagram for technology 1.

The present worth expression for this technology is

$$PW(20\%)_1 = -12,00,000 + 4,00,000 \times (P/A, 20\%, 10)$$

$$= -12,00,000 + 4,00,000 \times (4.1925)$$

$$= -12,00,000 + 16,77,000$$

$$= \text{Rs. } 4,77,000$$

The present worth expression for this technology is

$$PW(20\%)_2 = -20,00,000 + 6,00,000 \times (P/A, 20\%, 10)$$
$$= -20,00,000 + 6,00,000 \times (4.1925)$$
$$= -20,00,000 + 25,15,500$$
$$= \text{Rs. } 5,15,500$$

The present worth expression for this technology is

$$PW(20\%)_3 = -18,00,000 + 5,00,000 \times (P/A, 20\%, 10)$$
$$= -18,00,000 + 5,00,000 \times (4.1925)$$
$$= -18,00,000 + 20,96,250$$
$$= \text{Rs. } 2,96,250$$

From the above calculations, it is clear that the present worth of technology 2 is the highest among all the technologies. Therefore, technology 2 is suggested for implementation to expand the production.

EXAMPLE 4.2 An engineer has two bids for an elevator to be installed in a new building. The details of the bids for the elevators are as follows:

Bid	*Engineer's estimates*		
	Initial cost (Rs.)	*Service life* (years)	*Annual operations & maintenance cost* (Rs.)
Alpha Elevator Inc.	4,50,000	15	27,000
Beta Elevator Inc.	5,40,000	15	28,500

Determine which bid should be accepted, based on the present worth method of comparison assuming 15% interest rate, compounded annually.

Bid 1: Alpha Elevator Inc.

Initial cost, P = Rs. 4,50,000

Annual operation and maintenance cost, A = Rs. 27,000

Life = 15 years

Interest rate, i = 15%, compounded annually.

The cash flow diagram of bid 1 is shown in Fig. 4.6.

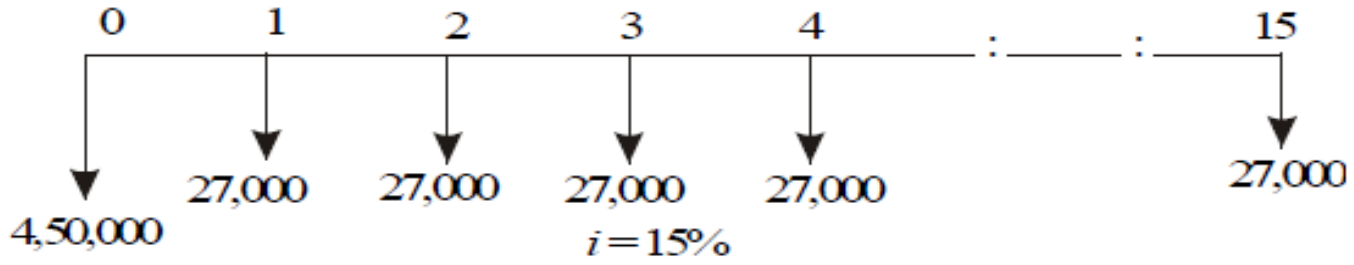

Fig. 4.6 Cash flow diagram for bid 1.

The present worth of the above cash flow diagram is computed as follows:

$$\begin{aligned} PW(15\%) &= 4,50,000 + 27,000(P/A,\ 15\%,\ 15) \\ &= 4,50,000 + 27,000 \times 5.8474 \\ &= 4,50,000 + 1,57,879.80 \\ &= \text{Rs. } 6,07,879.80 \end{aligned}$$

The cash flow diagram of bid 2 is shown in Fig. 4.7.

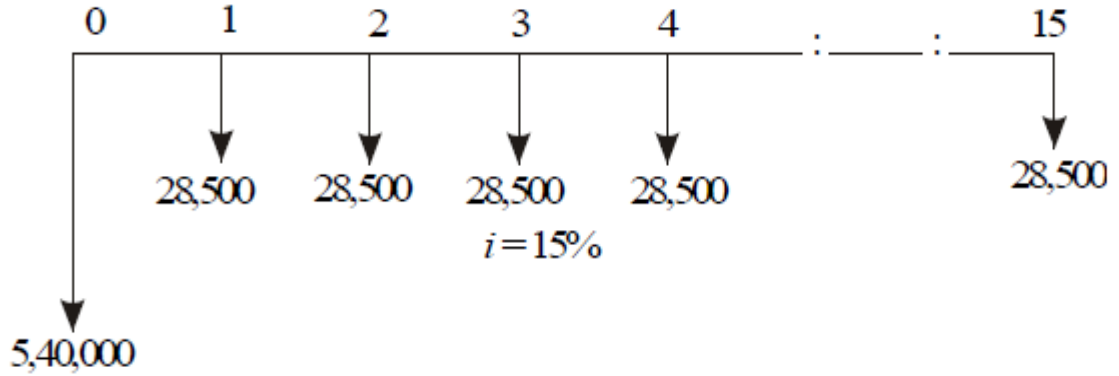

Fig. 4.7 Cash flow diagram for bid 2.

The present worth of the above cash flow diagram is computed as follows:

$$
\begin{aligned}
PW(15\%) &= 5{,}40{,}000 + 28{,}500(P/A,\ 15\%,\ 15) \\
&= 5{,}40{,}000 + 28{,}500 \times 5.8474 \\
&= 5{,}40{,}000 + 1{,}66{,}650.90 \\
&= \text{Rs. } 7{,}06{,}650.90
\end{aligned}
$$

The total present worth cost of bid 1 is less than that of bid 2. Hence, bid 1 is to be selected for implementation. That is, the elevator from Alpha Elevator Inc. is to be purchased and installed in the new building.

EXAMPLE 4.3 Investment proposals A and B have the net cash flows as follows:

Proposal	*End of years*				
	0	1	2	3	4
A (Rs.)	–10,000	3,000	3,000	7,000	6,000
B (Rs.)	–10,000	6,000	6,000	3,000	3,000

Compare the present worth of A with that of B at $i = 18\%$. Which proposal should be selected?

Solution

Present worth of A at $i = 18\%$. The cash flow diagram of proposal A is shown in Fig. 4.8.

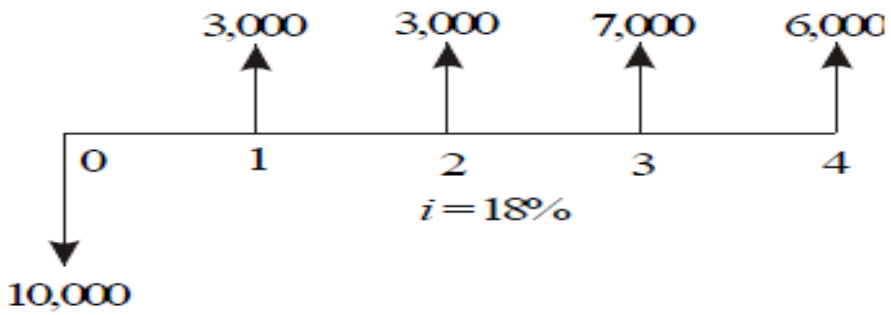

Fig. 4.8 Cash flow diagram for proposal A.

The present worth of the above cash flow diagram is computed as

$$PW_A(18\%) = -10{,}000 + 3{,}000(P/F, 18\%, 1) + 3{,}000(P/F, 18\%, 2) + 7{,}000(P/F, 18\%, 3) + 6{,}000(P/F, 18\%, 4)$$

$$= -10{,}000 + 3{,}000\ (0.8475) + 3{,}000(0.7182) + 7{,}000(0.6086) + 6{,}000(0.5158)$$

$$= \text{Rs. } 2{,}052.10$$

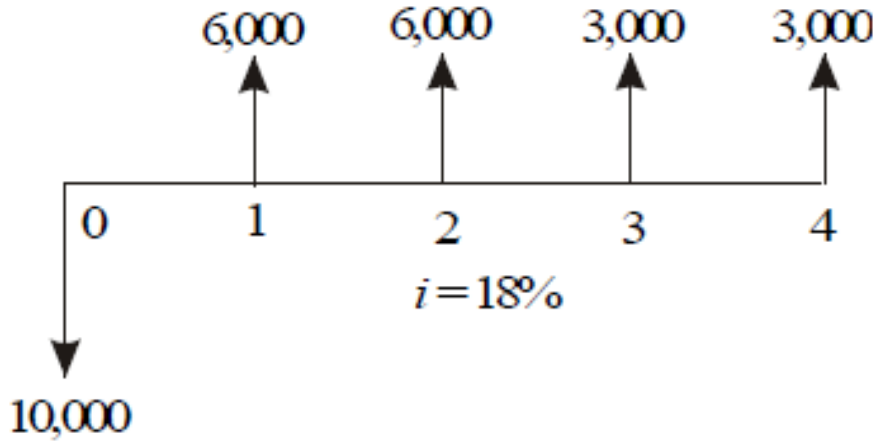

Fig. 4.9 Cash flow diagram for proposal B.

The present worth of the above cash flow diagram is calculated as

$$\begin{aligned} PW_B(18\%) &= -10{,}000 + 6{,}000(P/F, 18\%, 1) + 6{,}000(P/F, 18\%, 2) \\ &\quad + 3{,}000(P/F, 18\%, 3) + 3{,}000(P/F, 18\%, 4) \\ &= -10{,}000 + 6{,}000(0.8475) + 6{,}000(0.7182) \\ &\quad + 3{,}000(0.6086) + 3{,}000(0.5158) \\ &= \text{Rs. } 2{,}767.40 \end{aligned}$$

At i = 18%, the present worth of proposal B is higher than that of proposal A. Therefore, select proposal B.

EXAMPLE 4.4 A granite company is planning to buy a fully automated granite cutting machine. If it is purchased under down payment, the cost of the machine is Rs. 16,00,000. If it is purchased under installment basis, the company has to pay 25% of the cost at the time of purchase and the remaining amount in 10 annual equal installments of Rs. 2,00,000 each. Suggest the best alternative for the company using the present worth basis at i = 18%, compounded annually.

Present worth calculation of the second alternative. The cash flow diagram of the second alternative is shown in Fig. 4.10.

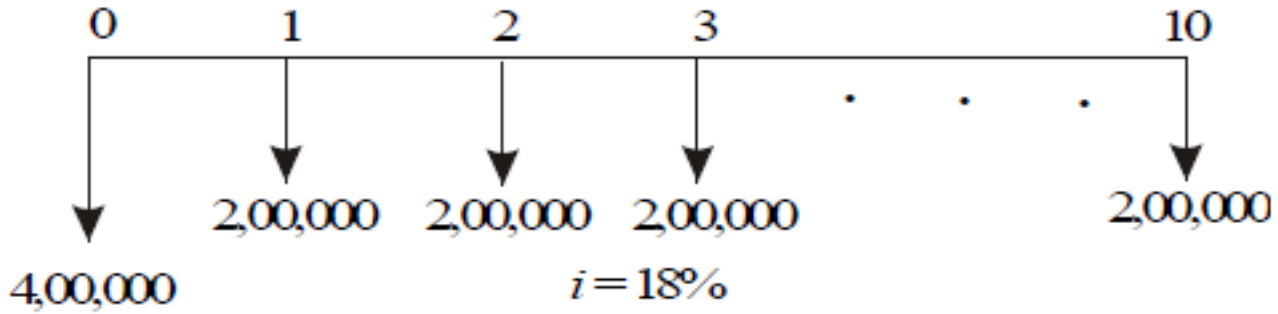

Fig. 4.10 Cash flow diagram for the second alternative.

The present worth of the above cash flow diagram is computed as

$$\begin{aligned} PW(18\%) &= 4{,}00{,}000 + 2{,}00{,}000(P/A,\ 18\%,\ 10) \\ &= 4{,}00{,}000 + 2{,}00{,}000 \times 4.4941 \\ &= \text{Rs. } 12{,}98{,}820 \end{aligned}$$

The present worth of this option is Rs. 12,98,820, which is less than the first option of complete down payment of Rs. 16,00,000. Hence, the company should select the second alternative to buy the fully automated granite cutting machine.

EXAMPLE 4.5 A finance company advertises two investment plans. In plan 1, the company pays Rs. 12,000 after 15 years for every Rs. 1,000 invested now. In plan 2, for every Rs. 1,000 invested, the company pays Rs. 4,000 at the end of the 10th year and Rs. 4,000 at the end of 15th year. Select the best investment plan from the investor's point of view at i = 12%, compounded annually.

AT WHAT RATE PER CENT PER ANNUM WILL A SUM OF MONEY DOUBLES IN 8 YEARS.?

SOLUTION

- $I=P\times i\times n$

$P=P\ i\ n$

$i=1/8=.125=12.5\%$

- A CERTAIN SUM AMOUNTS TO Rs 1008 IN TWO YEARS, Rs 1112 IN THREE YEARS , FIND THE RATE AND SUM.

- ANSWER:
- PRINCIPAL=800,
- RATE= 13%

Solution *Plan 1.* The cash flow diagram for plan 1 is illustrated in Fig. 4.11.

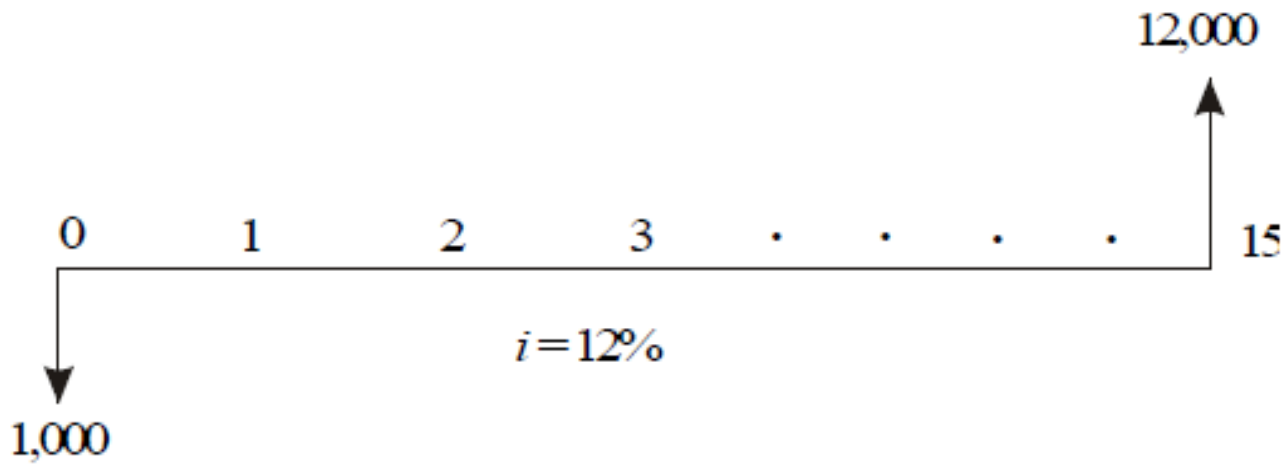

Fig. 4.11 Cash flow diagram for plan 1.

The present worth of the above cash flow diagram is calculated as

$$PW(12\%) = -1{,}000 + 12{,}000(P/F, 12\%, 15)$$
$$= -1{,}000 + 12{,}000(0.1827)$$
$$= \text{Rs. } 1{,}192.40$$

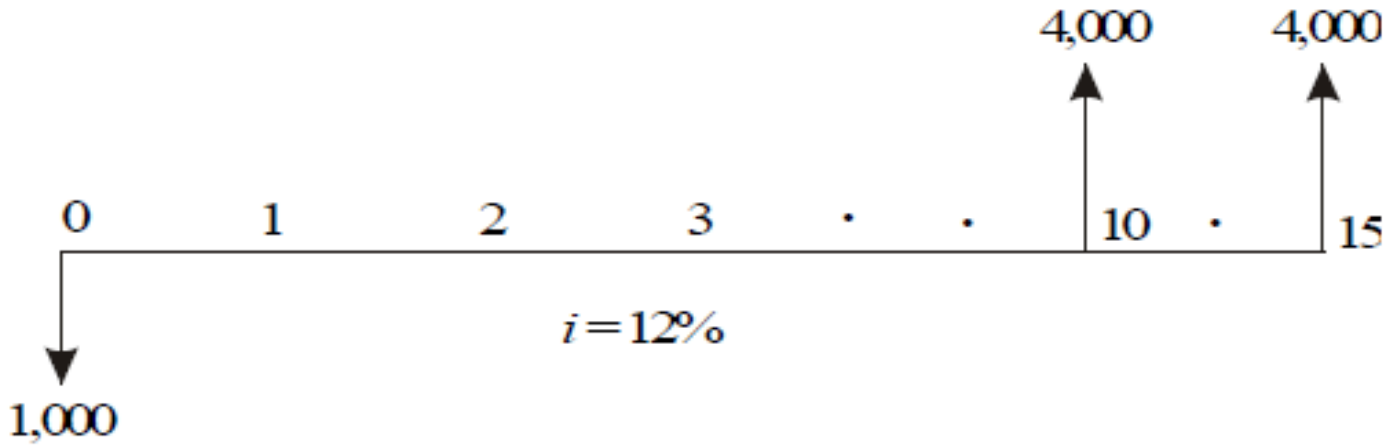

Fig. 4.12 Cash flow diagram for plan 2.

The present worth of the above cash flow diagram is computed as

$$\begin{aligned} PW(12\%) &= -1{,}000 + 4{,}000(P/F,\ 12\%,\ 10) + 4{,}000(P/F,\ 12\%,\ 15) \\ &= -1{,}000 + 4{,}000(0.3220) + 4{,}000(0.1827) \\ &= \text{Rs. } 1{,}018.80 \end{aligned}$$

The present worth of plan 1 is more than that of plan 2. Therefore, plan 1 is the best plan from the investor's point of view.

EXAMPLE 4.6 Novel Investment Ltd. accepts Rs. 10,000 at the end of every year for 20 years and pays the investor Rs. 8,00,000 at the end of the 20th year. Innovative Investment Ltd. accepts Rs. 10,000 at the end of every year for 20 years and pays the investor Rs. 15,00,000 at the end of the 25th year. Which is the best investment alternative? Use present worth base with $i = 12\%$.

Solution *Novel Investment Ltd's plan.* The cash flow diagram of Novel Investment Ltd's plan is shown in Fig. 4.13.

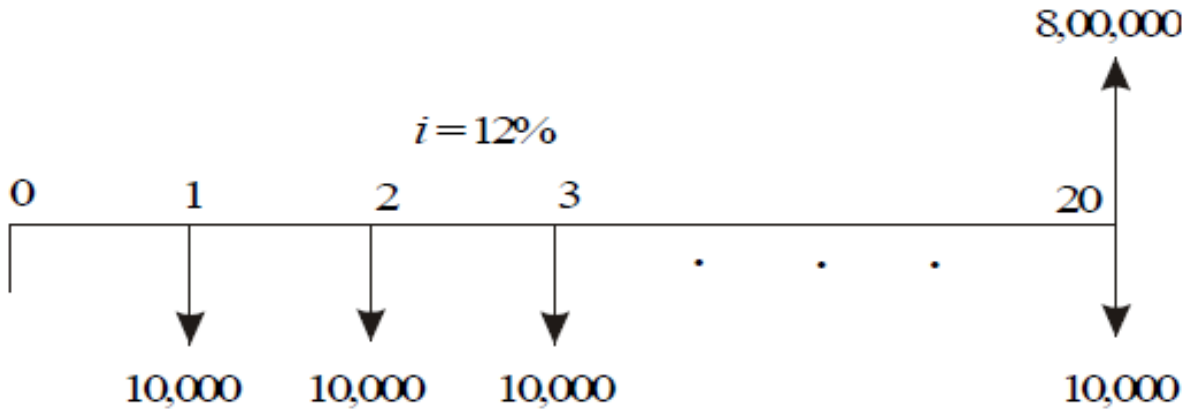

Fig. 4.13 Cash flow diagram for Novel Investment Ltd.

The present worth of the above cash flow diagram is computed as

$$PW(12\%) = -10{,}000(P/A,\ 12\%,\ 20) + 8{,}00{,}000(P/F,\ 12\%,\ 20)$$
$$= -10{,}000(7.4694) + 8{,}00{,}000(0.1037)$$
$$= \text{Rs. } 8{,}266$$

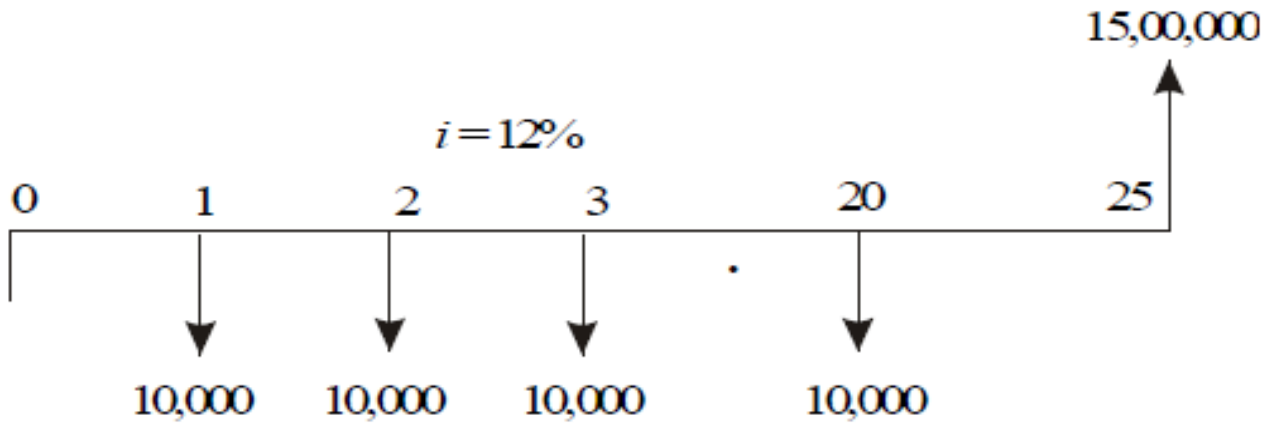

Fig. 4.14 Cash flow diagram for Innovative Investment Ltd.

The present worth of the above cash flow diagram is calculated as

$$PW(12\%) = -10{,}000(P/A,\ 12\%,\ 20) + 15{,}00{,}000(P/F,\ 12\%,\ 25)$$
$$= -10{,}000(7.4694) + 15{,}00{,}000(0.0588)$$
$$= \text{Rs. } 13{,}506$$

The present worth of Innovative Investment Ltd's plan is more than that of Novel Investment Ltd's plan. Therefore, Innovative Investment Ltd's plan is the best from investor's point of view.

EXAMPLE 4.7 A small business with an initial outlay of Rs. 12,000 yields Rs. 10,000 during the first year of its operation and the yield increases by Rs. 1,000 from its second year of operation up to its 10th year of operation. At the end of the life of the business, the salvage value is zero. Find the present worth of the business by assuming an interest rate of 18%, compounded annually.

Solution

Initial investment, P = Rs. 12,000

Income during the first year, A = Rs. 10,000

Annual increase in income, G = Rs. 1,000

n = 10 years

i = 18%, compounded annually

The cash flow diagram for the small business is depicted in Fig. 4.15.

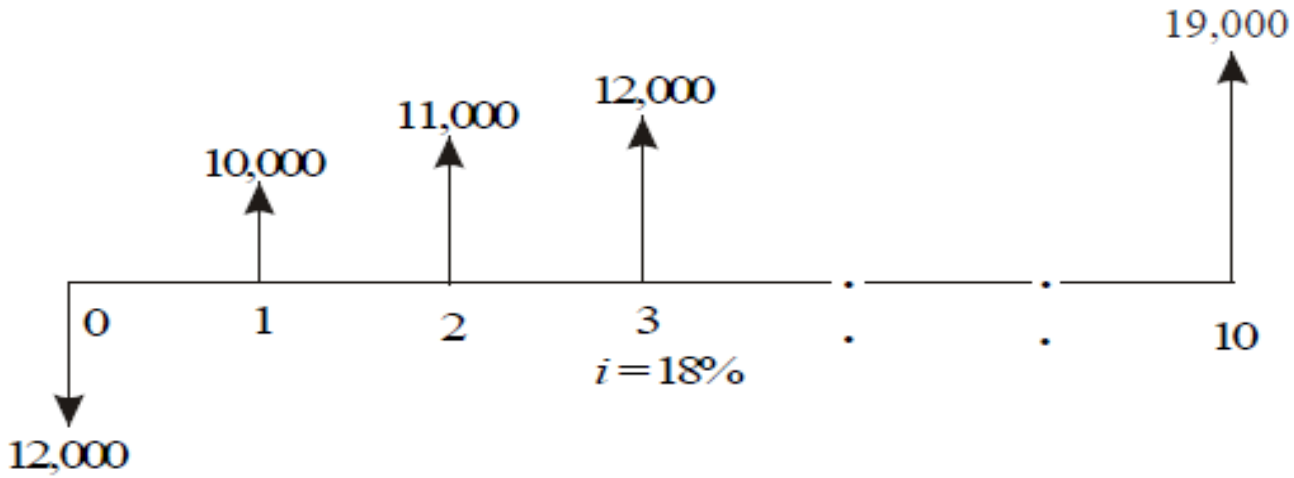

Fig. 4.15 Cash flow diagram for the small business.

The equation for the present worth is

$$PW(18\%) = -12{,}000 + (10{,}000 + 1{,}000 \times (A/G, 18\%, 10)) \times (P/A, 18\%, 10)$$

$$= -12{,}000 + (10{,}000 + 1{,}000 \times 3.1936) \times 4.4941$$

$$= -12{,}000 + 59{,}293.36$$

$$= \text{Rs. } 47{,}293.36$$

The present worth of the small business is Rs. 47,293.36.

FUTURE WORTH METHOD

5.1 INTRODUCTION

In the future worth method of comparison of alternatives, the future worth of various alternatives will be computed. Then, the alternative with the maximum future worth of net revenue or with the minimum future worth of net cost will be selected as the best alternative for implementation.

EXAMPLE 5.1 Consider the following two mutually exclusive alternatives:

	End of year				
Alternative	0	1	2	3	4
A (Rs.)	−50,00,000	20,00,000	20,00,000	20,00,000	20,00,000
B (Rs.)	−45,00,000	18,00,000	18,00,000	18,00,000	18,00,000

At i = 18%, select the best alternative based on future worth method of comparison.

Solution ***Alternative A***

Initial investment, P = Rs. 50,00,000
Annual equivalent revenue, A = Rs. 20,00,000
Interest rate, i = 18%, compounded annually
Life of alternative A = 4 years

The cash flow diagram of alternative A is shown in Fig. 5.3.

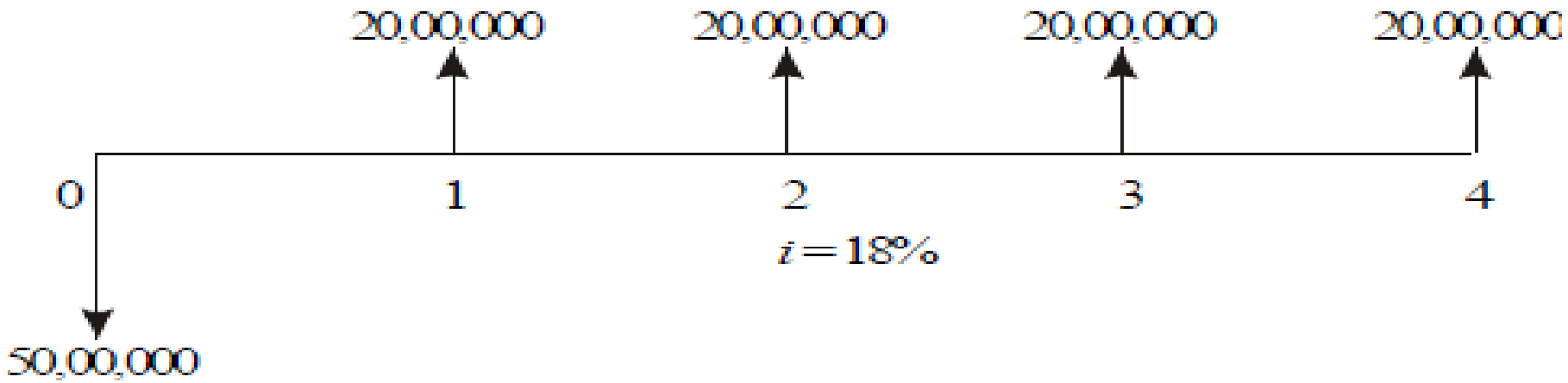

Fig. 5.3 Cash flow diagram for alternative A.

The future worth amount of alternative B is computed as

$$FW_A(18\%) = -50,00,000(F/P, 18\%, 4) + 20,00,000(F/A, 18\%, 4)$$
$$= -50,00,000(1.939) + 20,00,000(5.215)$$
$$= \text{Rs. } 7,35,000$$

Alternative B

Initial investment, P = Rs. 45,00,000

Annual equivalent revenue, A = Rs. 18,00,000

Interest rate, i = 18%, compounded annually

Life of alternative B = 4 years

The cash flow diagram of alternative B is illustrated in Fig. 5.4.

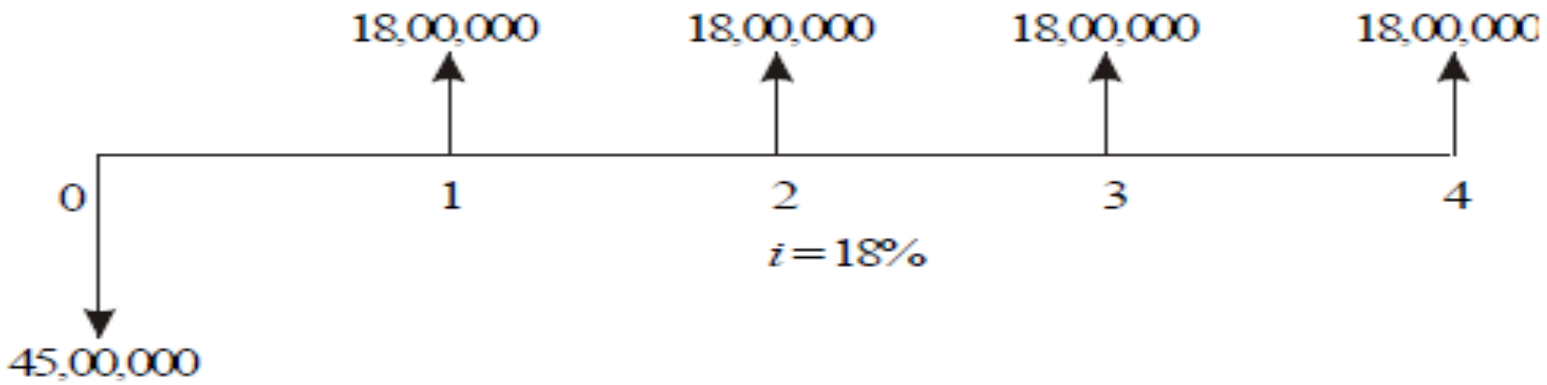

Fig. 5.4 Cash flow diagram for alternative B.

The future worth amount of alternative B is computed as

$$FW_B(18\%) = -45,00,000(F/P, 18\%, 4) + 18,00,000\ (F/A, 18\%, 4)$$

$$= -45,00,000(1.939) + 18,00,000(5.215)$$

$$= \text{Rs. } 6,61,500$$

EXAMPLE 5.2 A man owns a corner plot. He must decide which of the several alternatives to select in trying to obtain a desirable return on his investment. After much study and calculation, he decides that the two best alternatives are as given in the following table:

	Build gas station	*Build soft ice-cream stand*
First cost (Rs.)	20,00,000	36,00,000
Annual property taxes (Rs.)	80,000	1,50,000
Annual income (Rs.)	8,00,000	9,80,000
Life of building (years)	20	20
Salvage value (Rs.)	0	0

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

First cost = Rs. 20,00,000

Net annual income = Annual income − Annual property tax

= Rs. 8,00,000 − Rs. 80,000

= Rs. 7,20,000

Life = 20 years

Interest rate = 12%, compounded annually

The cash flow diagram for this alternative is depicted in Fig. 5.5.

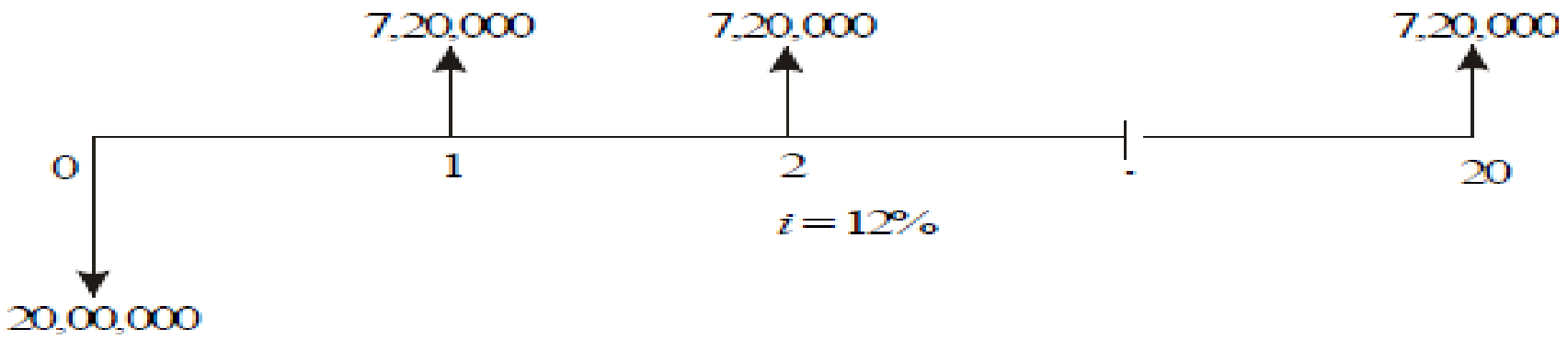

Fig. 5.5 Cash flow diagram for alternative 1.

The future worth of alternative 1 is computed as

$$FW_1(12\%) = -20,00,000\,(F/P,\ 12\%,\ 20) + 7,20,000\,(F/A,\ 12\%,\ 20)$$

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

$$= \text{Rs. } 3,25,85,440$$

Alternative 2—**Build soft ice-cream stand**

First cost = Rs. 36,00,000

Net annual income = Annual income − Annual property tax

= Rs. 9,80,000 − Rs. 1,50,000

= Rs. 8,30,000

Life = 20 years

Interest rate = 12%, compounded annually

The cash flow diagram for this alternative is shown in Fig. 5.6.

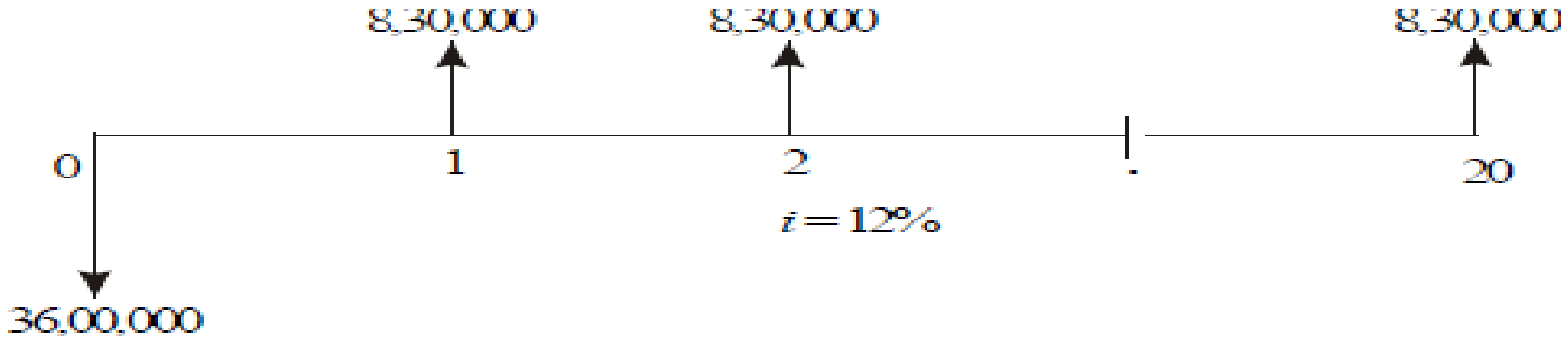

Fig. 5.6 Cash flow diagram for alternative 2.

The future worth of alternative 2 is calculated as

$$FW_2(12\%) = -36,00,000\,(F/P,\ 12\%,\ 20) + 8,30,000\,(F/A,\ 12\%,\ 20)$$

$$= -36,00,000\,(9.646) + 8,30,000\,(72.052)$$

$$= \text{Rs. } 2,50,77,560$$

EXAMPLE 5.3 The cash flow diagram of two mutually exclusive alternatives are given in Figs. 5.7 and 5.8.

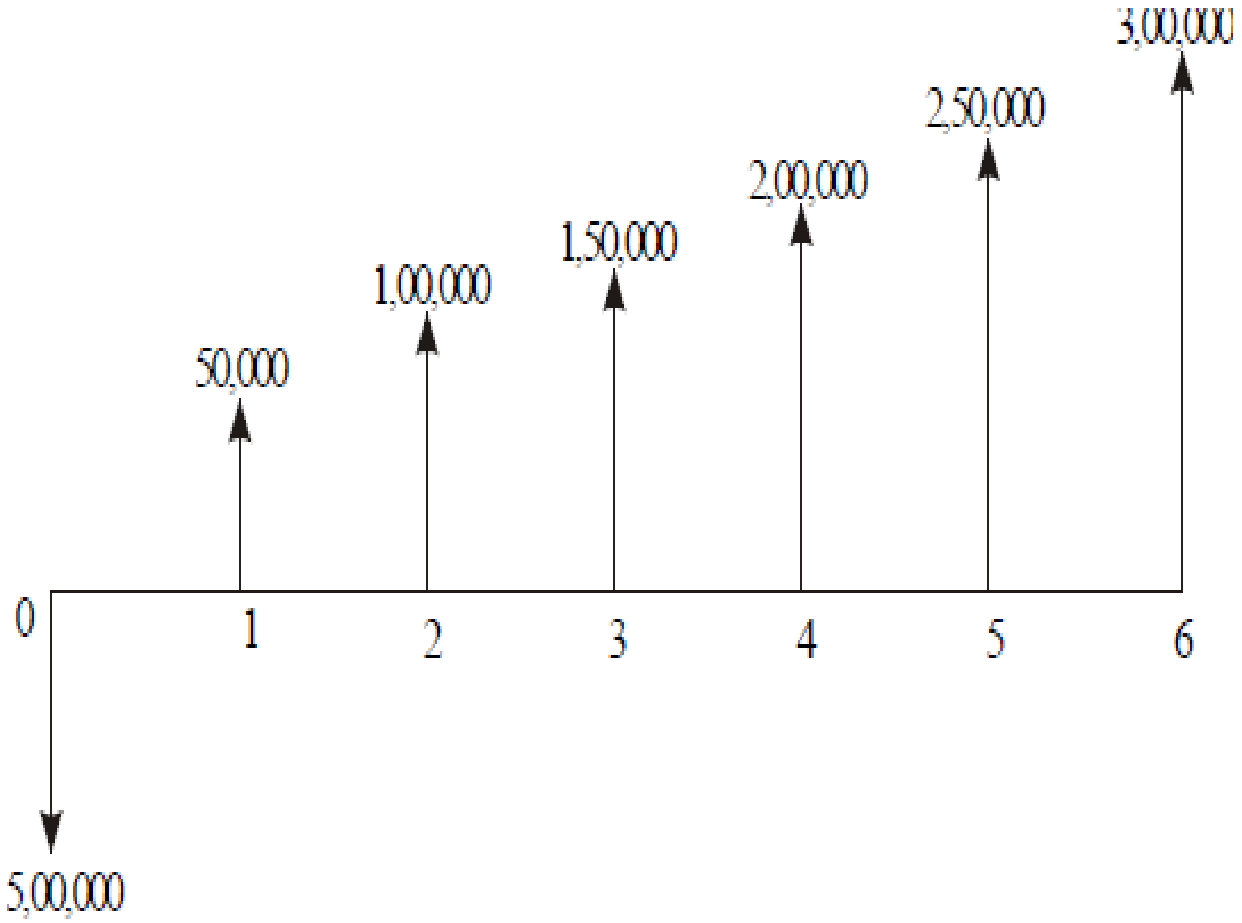

Fig. 5.7 Cash flow diagram for alternative 1.

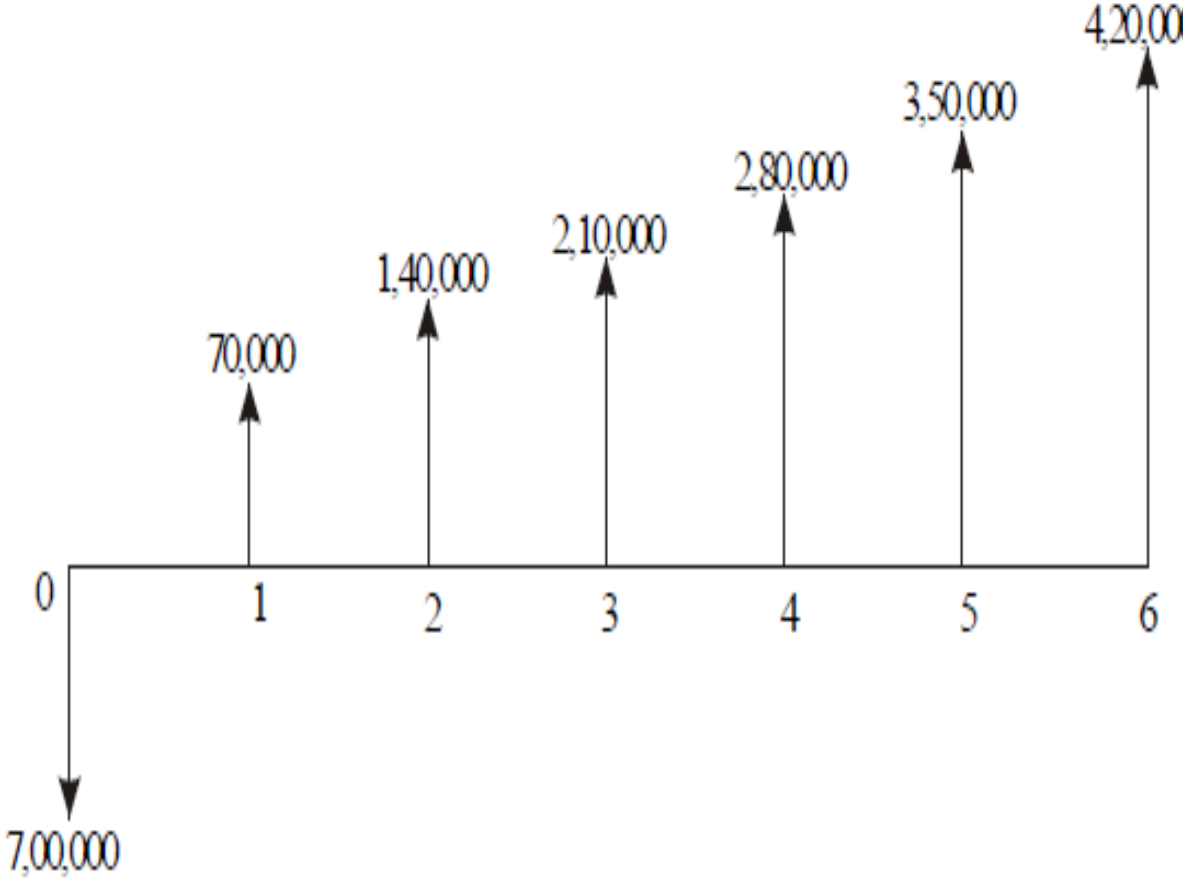

Fig. 5.8 Cash flow diagram for alternative 2.

(a) Select the best alternative based on future worth method at $i = 8\%$.
(b) Rework part (a) with $i = 9\%$ and 20%

(a) Evaluation at $i = 8\%$

***Alternative 1*—This comes under equal payment gradient series.**

P = Rs. 5,00,000

$A1$ = Rs. 50,000

G = Rs. 50,000

$i = 8\%$

$n = 6$ years

The formula for the future worth of alternative 1 is

$$FW_1(8\%) = -P(F/P, 8\%, 6) + [A1 + G(A/G, 8\%, 6)] \times (F/A, 8\%, 6)$$

$$= -5,00,000(1.587) + [50,000 + 50,000(2.2764)] \times 7.336$$

$$= -79,35,000 + 1,63,820 \times 7.336$$

$$= -79,35,000 + 12,01,784$$

$$= \text{Rs. } 4,08,283.52$$

Alternative 2—**This comes under equal payment gradient series.**

P = Rs. 7,00,000

$A1$ = Rs. 70,000

G = Rs. 70,000

i = 8%

n = 6 years

The formula for the future worth of alternative 2 is

$$FW_2(8\%) = -P(F/P, 8\%, 6) + [A1 + G(A/G, 8\%, 6)] \times (F/A, 8\%, 6)$$

$$FW_2(8\%) = -7,00,000 \times 1.587 + [70,000 + 70,000 \times 2.2764] \times 7.336$$

$$= -11,10,900 + 16,82,497$$

$$= \text{Rs. } 5,71,596.93$$

The future worth of alternative 2 is more than that of alternative 1. Therefore, alternative 2 must be selected.

(b) (i) Evaluation at $i = 9\%$: Alternative 1

P = Rs. 5,00,000

$A1$ = Rs. 50,000

G = Rs. 50,000

n = 6 years

The formula for the future worth of alternative 1 is as follows:

$$FW_1(9\%) = -P(F/P, 9\%, 6) + [A1 + G(A/G, 9\%, 6)] \times (F/A, 9\%, 6)$$
$$= -5,00,000\ (1.677) + [50,000 + 50,000\,(2.2498)] \times 7.523$$
$$= -8,38,500 + 12,22,412.27$$
$$= \text{Rs. } 3,83,912.27$$

Alternative 2

P = Rs. 7,00,000

$A1$ = Rs. 70,000

G = Rs. 70,000

n = 6 years

The formula for the future worth of the alternative 2 is

$$FW_2(9\%) = -P(F/P, 9\%, 6) + [A1 + G(A/G, 9\%, 6)] \times (F/A, 9\%, 6)$$
$$= -7,00,000 \times 1.677 + [70,000 + 70,000 \times 2.2498] \times 7.523$$
$$= -11,73,900 + 17,11,377.18$$
$$= \text{Rs. } 5,37,477.18$$

The future worth of alternative 2 is more than that of alternative 1. Therefore, alternative 2 must be selected.

(ii) Evaluation at i = 20%: Alternative 1

P = Rs. 5,00,000

$A1$ = Rs. 50,000

G = Rs. 50,000

n = 6 years

The formula for the future worth of alternative 1 is

$$\begin{aligned} FW_1(20\%) &= -P(F/P, 20\%, 6) + [A1 + G(A/G, 20\%, 6)] \times (F/A, 20\%, 6) \\ &= -5,00,000(2.986) + [50,000 + 50,000(1.9788)] \times 9.93 \\ &= -14,93,000 + 14,78,974.20 \\ &= \text{Rs. } -14,025.80 \end{aligned}$$

The negative sign of the future worth amount indicates that alternative 1 incurs loss.

Alternative 2

P = Rs. 7,00,000

$A1$ = Rs. 70,000

G = Rs. 70,000

n = 6 years

The formula for the future worth of alternative 2 is

$$\begin{aligned} FW_2(20\%) &= -P(F/P, 20\%, 6) + [A1 + G(A/G, 20\%, 6)] \times (F/A, 20\%, 6) \\ &= -7,00,000 \times 2.986 + [70,000 + 70,000 \times 1.9788] \times 9.93 \\ &= -20,90,200 + 20,70,563.88 \\ &= \text{Rs. } -19,636.12 \end{aligned}$$

The negative sign of the above future worth amount indicates that alternative 2 incurs loss. Thus, none of the two alternatives should be selected.

EXAMPLE 5.4 M/S Krishna Castings Ltd. is planning to replace its annealing furnace. It has received tenders from three different original manufacturers of annealing furnace. The details are as follows.

	Manufacturer		
	1	2	3
Initial cost (Rs.)	80,00,000	70,00,000	90,00,000
Life (years)	12	12	12
Annual operation and maintenance cost (Rs.)	8,00,000	9,00,000	8,50,000
Salvage value after 12 years	5,00,000	4,00,000	7,00,000

Which is the best alternative based on future worth method at $i = 20\%$?

Solution Alternative 1—Manufacturer 1

First cost, P = Rs. 80,00,000
Life, n = 12 years

Annual operating and maintenance cost, A = Rs. 8,00,000
Salvage value at the end of furnace life = Rs. 5,00,000

The cash flow diagram for this alternative is shown in Fig. 5.9.

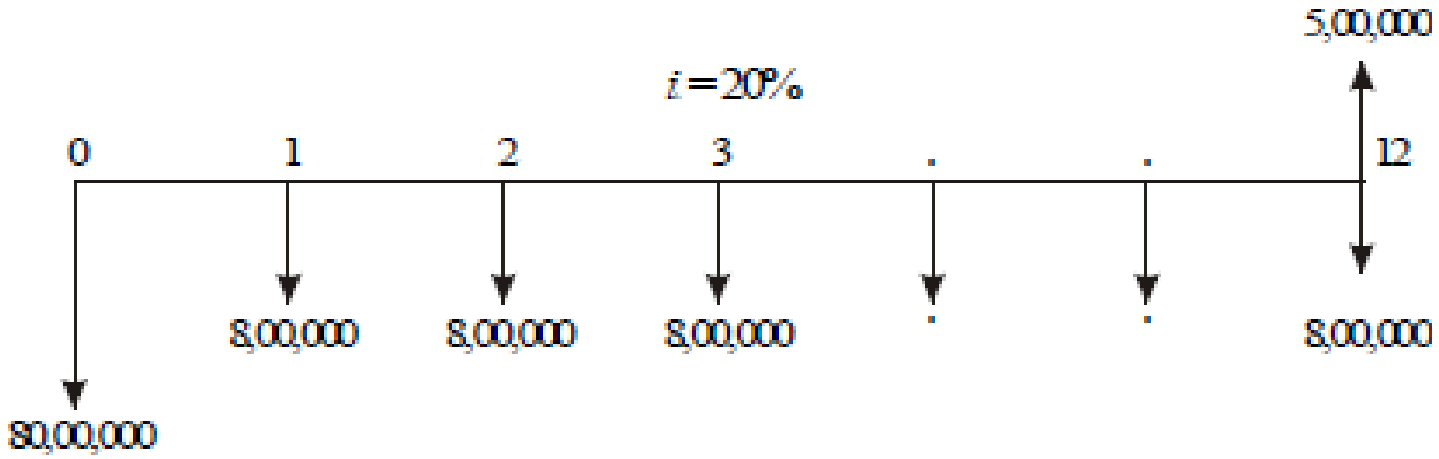

Fig. 5.9 Cash flow diagram for manufacturer 1.

The future worth amount of alternative 1 is computed as

$$FW_1(20\%) = 80,00,000\,(F/P,\ 20\%,\ 12) + 8,00,000\,(F/A,\ 20\%,\ 12) - 5,00,000$$
$$= 80,00,000(8.916) + 8,00,000\,(39.581) - 5,00,000$$
$$= \text{Rs. } 10,24,92,800$$

Alternative 2— Manufacturer 2

First cost, P = Rs. 70,00,000
Life, n = 12 years
Annual operating and maintenance cost, A = Rs. 9,00,000
Salvage value at the end of furnace life = Rs. 4,00,000

The cash flow diagram for this alternative is given in Fig. 5.10.

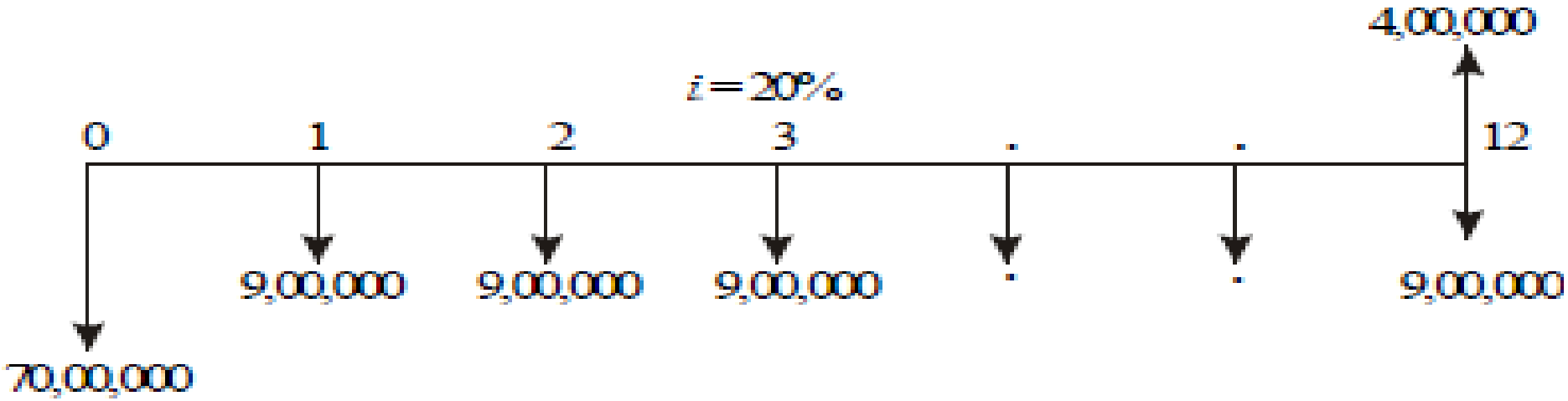

Fig. 5.10 Cash flow diagram for manufacturer 2.

The future worth amount of alternative 2 is computed as

$$FW_2(20\%) = 70,00,000(F/P,\ 20\%,\ 12) + 9,00,000(F/A,\ 20\%,\ 12) - 4,00,000$$
$$= 70,00,000(8.916) + 9,00,000\ (39.581) - 4,00,000$$
$$= \text{Rs. } 9,76,34,900$$

Alternative 3—Manufacturer 3

First cost, P = Rs. 90,00,000
Life, n = 12 years

Annual operating and maintenance cost, A = Rs. 8,50,000
Salvage value at the end of furnace life = Rs. 7,00,000

The cash flow diagram for this alternative is illustrated in Fig. 5.11.

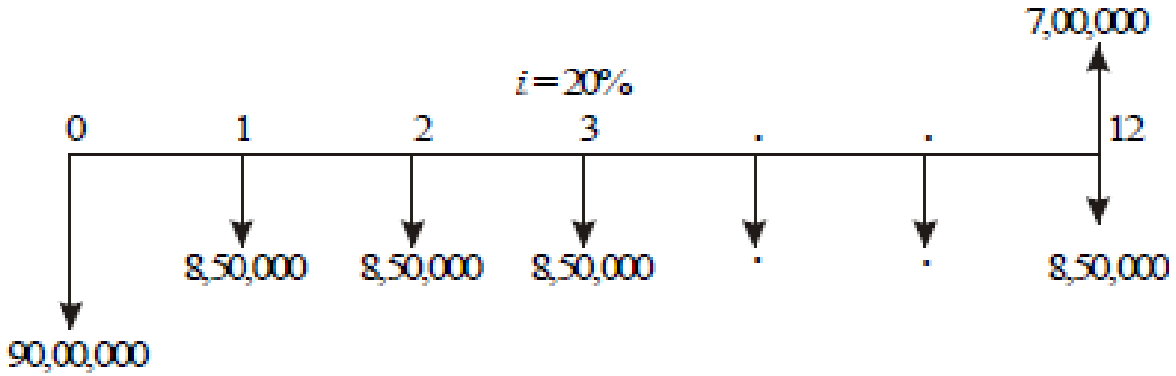

Fig. 5.11 Cash flow diagram for manufacturer 3.

The future worth amount of alternative 3 is calculated as

$$FW_3(20\%) = 90,00,000(F/P, 20\%, 12) + 8,50,000(F/A, 20\%, 12) - 7,00,000$$
$$= 90,00,000(8.916) + 8,50,000(39.581) - 7,00,000$$
$$= \text{Rs. } 11,31,87,850$$

The future worth cost of alternative 2 is less than that of the other two alternatives. Therefore, M/s. Krishna castings should buy the annealing furnace from manufacturer 2.

EXAMPLE 5.5 A company must decide whether to buy machine *A* or machine *B*:

	Machine A	*Machine B*
Initial cost	Rs. 4,00,000	Rs. 8,00,000
Useful life, in years	4	4
Salvage value at the end of machine life	Rs. 2,00,000	Rs. 5,50,000
Annual maintenance cost	Rs. 40,000	0

At 12% interest rate, which machine should be selected? (Use future worth method of comparison).

Solution *Machine A*

Initial cost of the machine, P = Rs. 4,00,000

Life, n = 4 years

Salvage value at the end of machine life, S = Rs. 2,00,000

Annual maintenance cost, A = Rs. 40,000

Interest rate, i = 12%, compounded annually.

The cash flow diagram of machine A is given in Fig. 5.12.

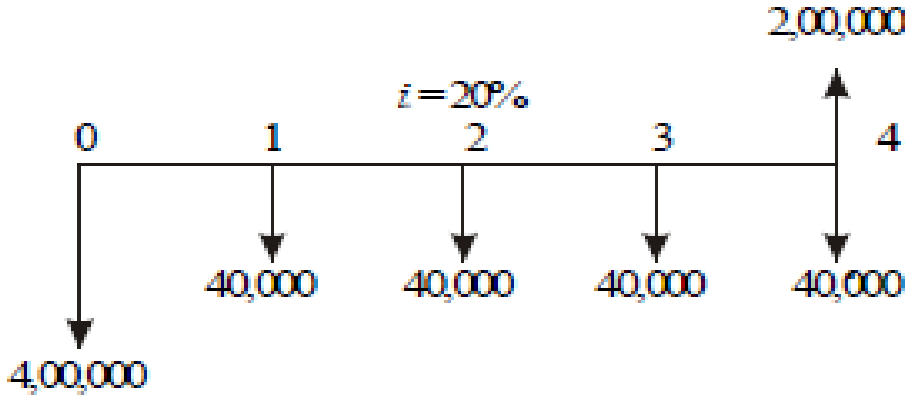

Fig. 5.12 Cash flow diagram for machine A.

The future worth function of Fig. 5.12 is

$$FW_A(12\%) = 4,00,000 \times (F/P, 12\%, 4) + 40,000 \times (F/A, 12\%, 4) - 2,00,000$$
$$= 4,00,000 \times (1.574) + 40,000 \times (4.779) - 2,00,000$$
$$= \text{Rs. } 6,20,760$$

Machine B

Machine B

Initial cost of the machine, P = Rs. 8,00,000

Life, n = 4 years

Salvage value at the end of machine life, S = Rs. 5,50,000

Annual maintenance cost, A = zero.

Interest rate, i = 12%, compounded annually.

The cash flow diagram of the machine B is illustrated in Fig. 5.13.

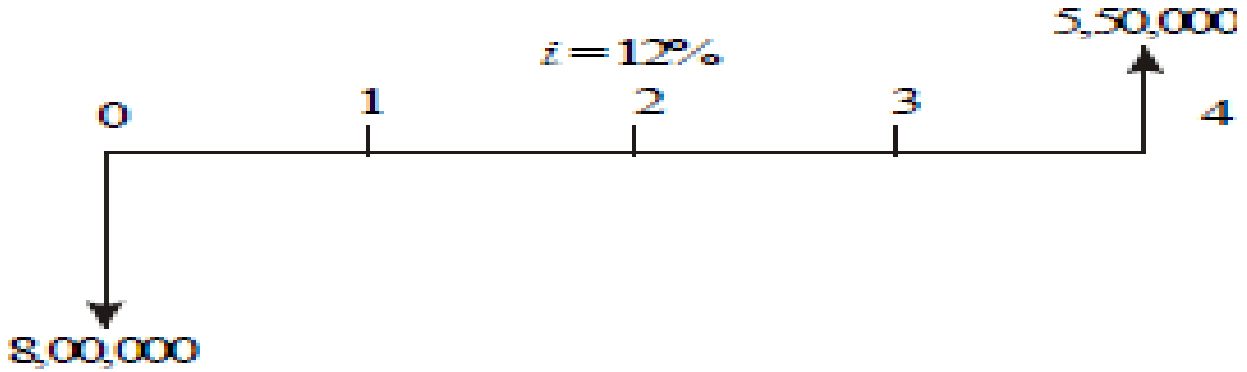

Fig. 5.13 Cash flow diagram for machine B.

The future worth function of Fig 5.13 is

$$FW_B(12\%) = 8,00,000 \times (F/P, 12\%, 4) - 5,50,000$$
$$= 8,00,000 \times (1.574) - 5,50,000$$
$$= \text{Rs. } 7,09,200$$

The future worth cost of machine A is less than that of machine B. Therefore, machine A should be selected.

- A SUM WAS PUT AT SIMPLE INTEREST AT A CERTAIN RATE FOR 2 YEARS. HAD IT BEEN PUT AT 3% HIGHER RATE, IT WOULD HAVE FETCHED Rs 300 MORE. FIND THE SUM.
- ANSWER: 5000

- A SHOPKEEPER BORROWED Rs 20000FROM TWO MONEY LENDERS. FOR ONE LOAN HE PAID 12%
- AND FOR THE OTHER 14% P.ER ANNUM. AFTER ONE YEAR, HE PAID Rs 2560 AS INTEREST, HOW MUCH DID HE BORROW AT EACH RATE.?
- ANS 12000 @12% AND 8000 @ 14%