Example:

1. **Two holiday cottages are under consideration. Compare the Present Worth of the cost of 24 years service, at an interest rate of 5 percent, when neither cottage has a realizable salvage value.**

	Cottage 1	Cottage 2
First cost	Rs.4,500	Rs.10,000
Estimated life	12 years	24 years
Annual maintenance cost	Rs.1,000	Rs.720

(VTU Jan 2006)

Solution: In this problem, the service life of cottage 1 is 24 years while the life of cottage 2 is 12 years. The LCM of 24 and 12 happens to be 24. Hence the Present Worth of both cottages have to be found for n = 24 years.

To find PW(Cottage 2)

Given data:

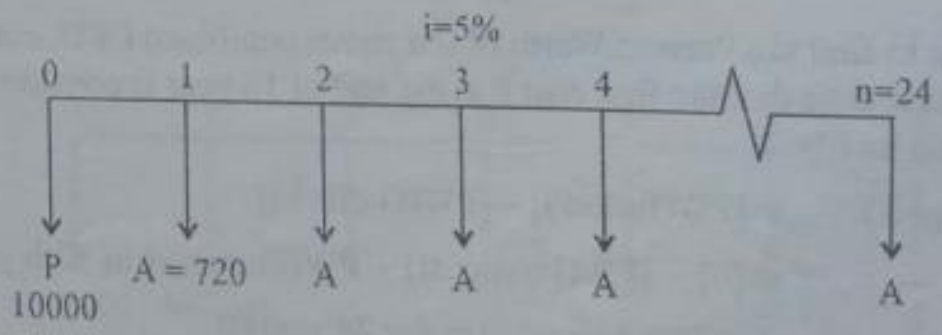
First Cost, P = 10,000 →(outflow)

Annual Maintenance Cost, A = Rs.720 → (outflow)

Estimate life, n = 24 years

Rate of interest, i = 5%

The cash flow diagram for the above problem would be,



PW(Cottage 2) = PW(Inflow) – PW(Outflow)

= 0 – PW(First cost) – PW(Annual Cost)

= 0 – 10,000 – A(P/A, i, n)

= 0 – 10,000 – 720(P/A, 5%, 24)

= 0 – 10,000 – 720(13.7987)

PW(Cottage 2) = Rs. – 19,935

To find PW(Cottage 1)

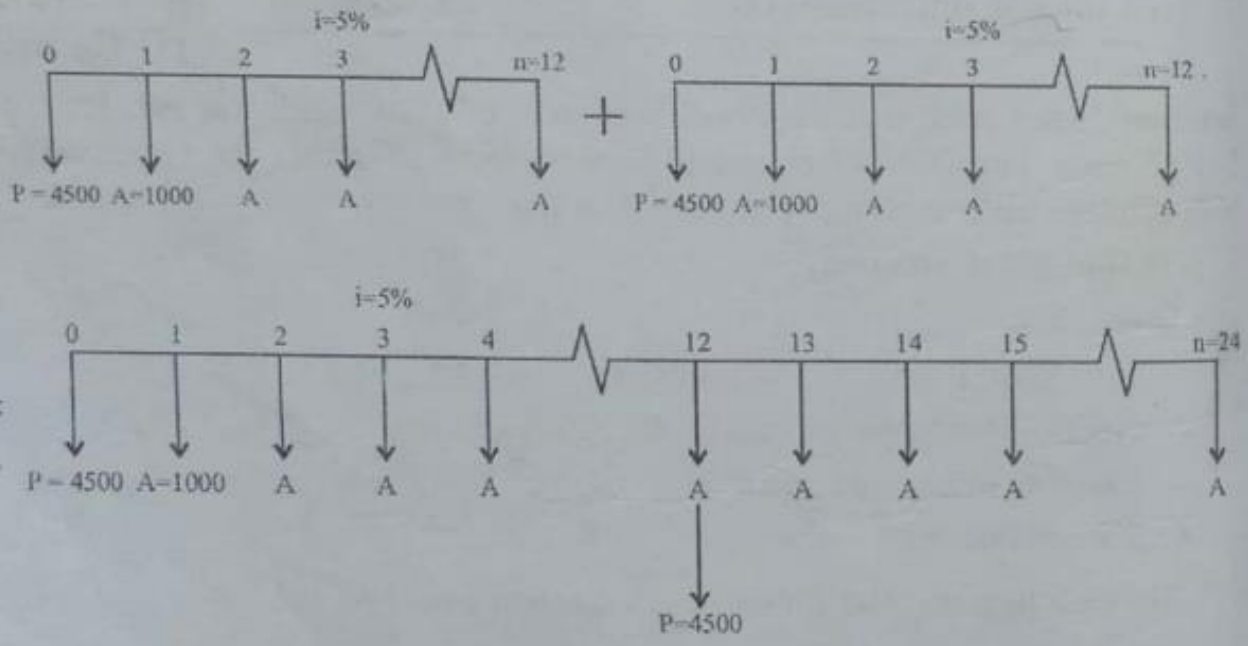
Given data,

P = Rs.4500 → (outflow)

A = Rs.1000 → (outflow)

n = 12 years (to be doubled)

i = 5%



We have to find the Present Worth of the above combined CFD, considering it as one. Also please note that the first cost P at the end of 12 year is considered as a future amount to find its PW.

∴ PW(Cottage 1) = [PW(Inflow)] – [PW(Outflow)]

= [0] – [PW(First cost) + PW(First cost in 12th year)

+ PW(Annual cost for 24 years)]

$$= -4{,}500 - F(P/F, i, n) - 1000(P/A, i, n)$$

$$= -4{,}500 - F(P/F, 5\%, 12) - 1{,}000(P/A, 5\%, 24)$$

$$= -4{,}500 - 4{,}500\ (0.5568) - 1{,}000(13.7986)$$

PW(Cottage 1) = Rs.– 20,804

Since cottages 1 and 2 are being compared for the same service life i.e., n = 24 years, their Present Worths can be compared. Since the algebraic value PW of cottage 2 is higher, it is selected. It means that cottage 2 has lower costs than cottage 1.

Example:

2. The following alternatives are available to accomplish an objective of 12 year duration.

	Plan A	Plan B	Plan C
Life cycle(yrs)	6	3	4
First cost(Rs.)	2,000	8,000	10,000
Annual cost (Rs.)	3,200	700	500

Compare the present worth of the alternatives using an interest rate of 7 percent. (VTU July 2006)

Solution: In the given problem, service lives of the 3 plans are 6, 3 and 4 years respectively. The LCM here is 12 years. Each plan therefore has to be evaluated for 12 years with their CFD's suitably multiplied.

To find Present Worth (Plan A)

Given data:

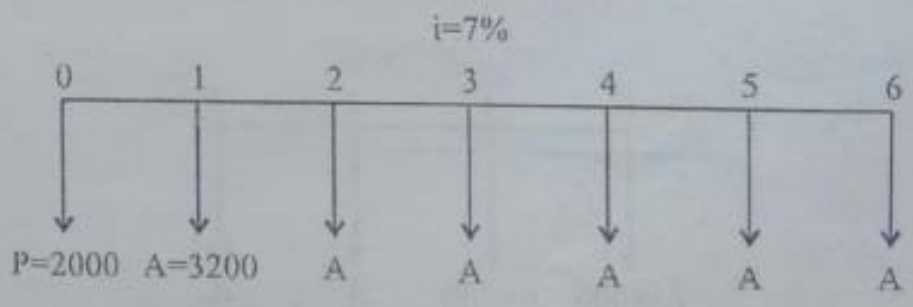
First Cost, P = Rs. 2,000 → (outflow)

Annual cost, A = Rs.3,200 → (outflow)

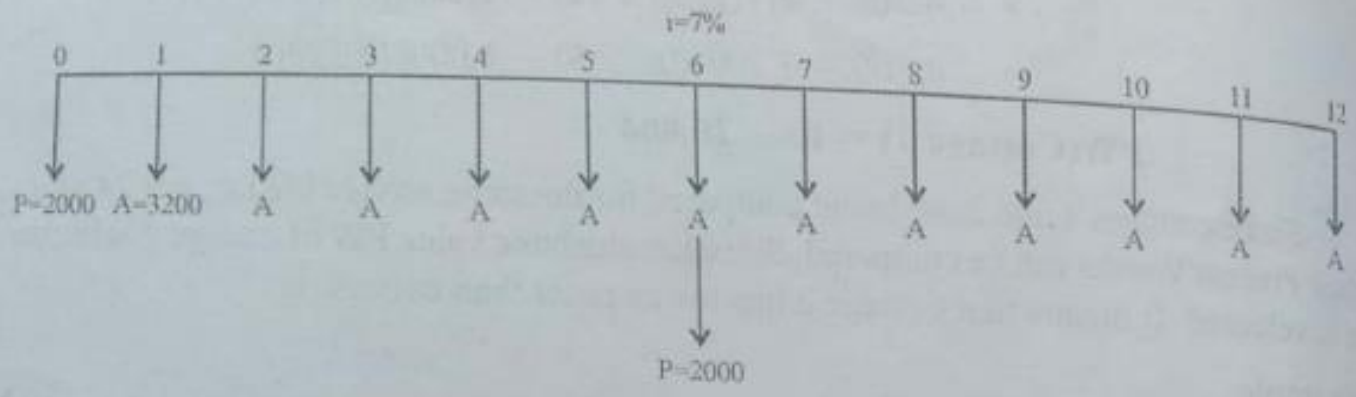
Life cycle, n = 6 years → (to be doubled)

Rate of interest, i = 7%

Single CFD for the above problem would be:



If we double the above CFD, then it would become



Now, Present Worth for the combined CFD for Plan A would be found as follows. Please note that first cost P at n=6 is considered as F whose PW has to be found.

PW(Plan A) = [PW(all inflow)] – [PW(all outflow)]

= [0] – [PW(First cost at year 0) + PW(First cost considered at year 6) + PW(Annual cost for 12 years)]

= 0 – 2000 – F(P/F, i, n) – A(P/A, i, n)

= – 2000 – 2000(P/F, 7%, 6) – 3200(P/A, 7%, 12)

= – 2000 – 2000(0.6664) – 3200(7.9427)

∴ **PW(Plan A) = Rs.– 28,749**

To find Present Worth (Plan B)

Given data,

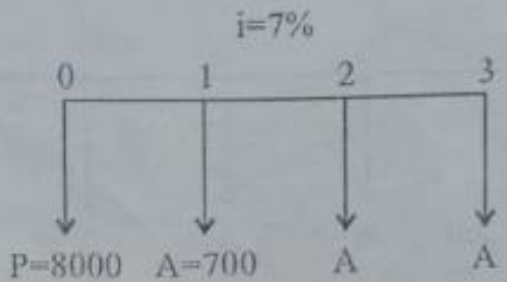
P = Rs.8,000 → (outflow)

A = Rs.7,00 → (outflow)

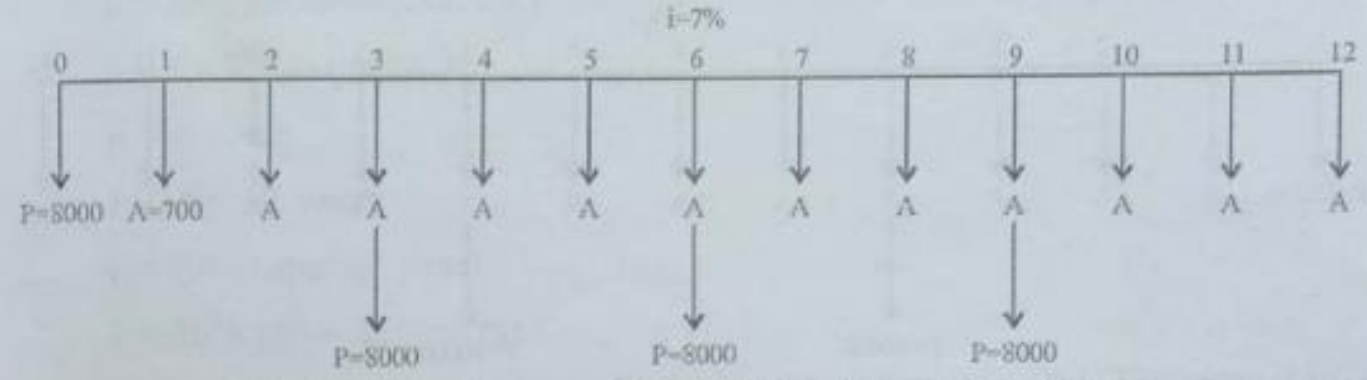
n = 3 years → (to be quadrupled)

i = 7%

Single CFD for the above problem would be,



Four times the above CFD would become,



Now, Present Worth of the above combined CFD of Plan B would be,

PW(Plan B) = PW(inflow) – PW(outflow)

= 0 – PW(First cost at n = 0) – PW(First cost at n = 3) – PW(First cost at n = 6) – PW(First cost at n = 9) – PW(Common annual cost for 12 years)

= – F(P/F, i, n) – F(P/F, i, n) – F(P/F, i, n) – F(P/F, i, n) – A(P/A, i, n)

= – 8,000 – 8,000(P/F, 7%, 3) – 8,000(P/F, 7%, 6) – 8,000(P/F, 7%, 9) – 700(P/A, 7%, 12)

= – 8,000 – 8,000(0.8163) – 8,000(0.6664) – 8,000(0.5439) –700(7.9427)

PW(Plan B) = – 29,772

To find Present Worth (Plan C)

Given data:

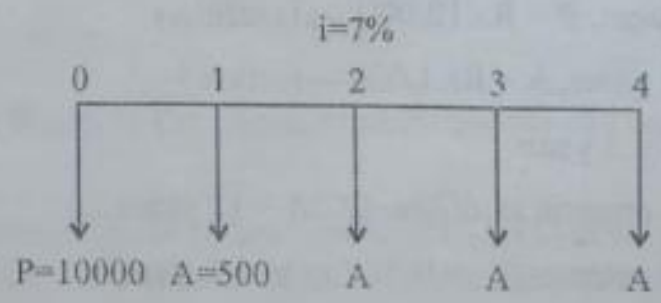
P = Rs.10,000 → (outflow)

A = Rs.500 → (outflow)

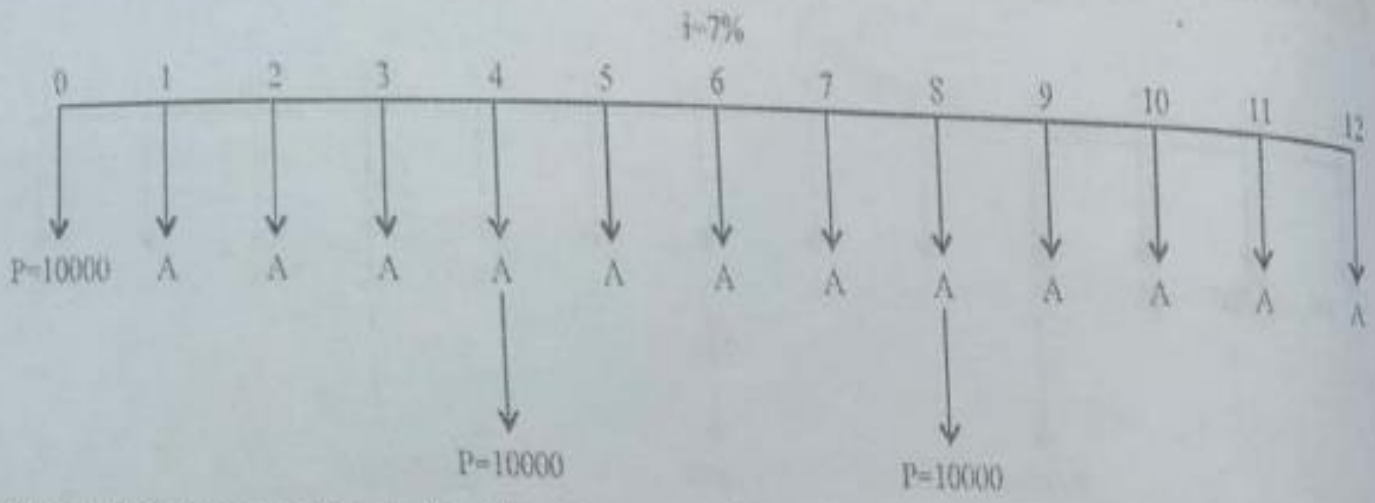
n = 4 years → (to be trebled)

i = 7%

Single CFD for the above problem would be



If the above CFD is trebled, then it would become



Now, the Present Worth for the above combined CFD of Plan C would be,

PW(Plan C) = PW(Inflow) – PW(Outflow)

= 0 – P – PW(First cost at n = 0) – PW(First cost at n = 4) – PW(First cost at n = 8) – PW(Common annual cost for 12 years)

= – P – F(P/F, 7%, 4) – F(P/F, 7%, 8) – A(P/A, 7%, 12)

= – 10,000 – 10,000(0.7629) – 10,000(0.5820) – 500(7.9427)

PW(Plan C) = Rs.– 27,420

Answer: Comparing the Present Worth of Plans A, B and C, we see that Plan C has the highest PW (or the least –Ve value). Hence Plan C is the best.

Date
Page

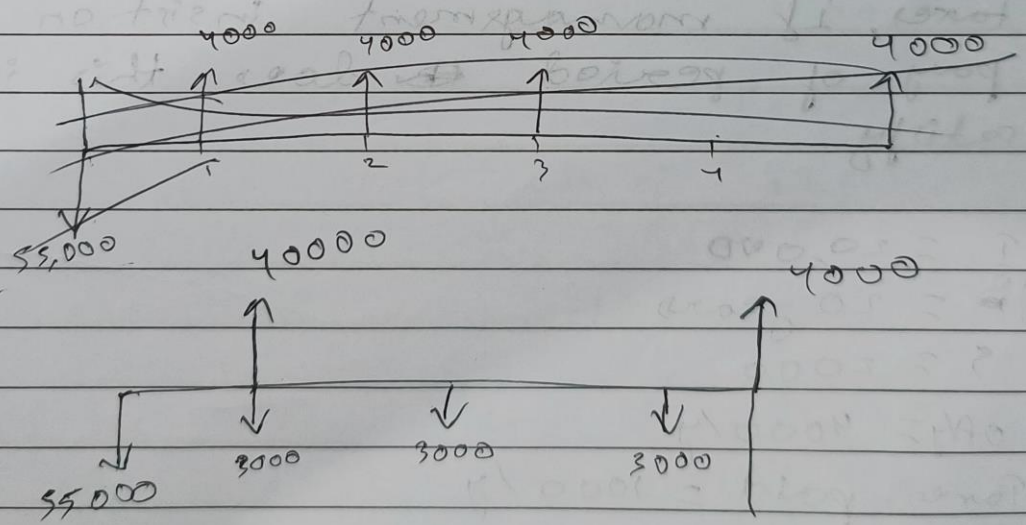
Economics

Q. Auto con company is evaluating 3 robots for possible use in the assembling operation (only 1 robot will be purchased) Data associated with these robots are as follows :-

	Robot A	Robot B	Robot C
First cost Rs	55,000	58,000	53,000
Operation & Maintac. cost	3000/year	45,00/year	4000/year
Expected income	40000/year	44000/year	38000/year
Estimated salavey value (Rs)	4000	6000	4000

Assuming a technological life of 3 years under desired Interest Rate of which robot seems to be preferable. Assuming all factors are similar ?- Use a net present worth equivalation

CFD for Robot A



$PW_A = -55,000 - 3000(P/A, 12\%, 3) + 40000(P/A, 12\%, 3) + 4000(P/F, 12\%, 3)$

$= -55,000 - (3000 \times 2.402) + 40000(2.402) + 4000(0.7118)$

$= 36721.2$

Robot B

$PW_B = -58000 - 4500(P/A, 12\%, 3) + 44000(P/A, 12\%, 3) + 6000(P/F, 12\%, 3)$

$= -58000 - 4500(2.402) + 44000(2.402) + (6000 \times 0.7118)$

Robot C

$PW_C = -53000 - 4000(P/A, 12\%, 3) + 38000(P/A, 12\%, 3) + 4000(P/F, 12\%, 3)$

$= -53000 - 4000(2.402)$

The Late City Bank is considering

EXAMPLE 4.4 A granite company is planning to buy a fully automated granite cuttingmachine. 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.

Solution There are two alternatives available for the company:

1. Down payment of Rs. 16,00,000
2. Down payment of Rs. 4,00,000 and 10 annual equal installments of Rs. 2,00,000 each

Present worth calculation of the second alternative. The cash flow diagram of the second

$$\begin{aligned} PW_A(18\%) &= -10{,}000 + 3{,}000(P/F, 18\%, 1) + 3{,}000(P/F, 18\%, 2) \\ &\quad + 7{,}000(P/F, 18\%, 3) + 6{,}000(P/F, 18\%, 4) \\ &= -10{,}000 + 3{,}000\,(0.8475) + 3{,}000(0.7182) \\ &\quad + 7{,}000(0.6086) + 6{,}000(0.5158) \\ &= \text{Rs. } 2{,}052.10 \end{aligned}$$

Present worth of B at i = 18%. The cash flow diagram of the proposal B is shown in Fig. 4.9

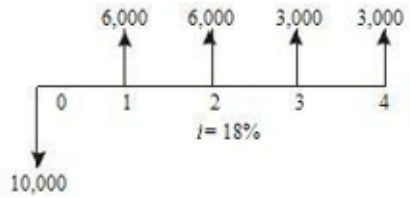


Fig. 4.9 Cash flow diagram for proposal B

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

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

$$\begin{aligned} &\quad + 3{,}000(0.6086) + 3{,}000(0.5158) \\ &= \text{Rs. } 2{,}767.40 \end{aligned}$$

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

UNIT 3

Three rates of return appear frequently in engineering economic studies:

i. The Minimum Acceptable Rate of Return (MARR)

ii. The Internal Rate of Return (IRR)

iii. The External Rate of Return (ERR)

I. MINIMUM ACCEPTABLE RATE OF RETURN (MARR)

This is rate of interest set by an organization to designate the lowest level of return that makes an investment acceptable. In other words , a minimum acceptable rare of return is the lowest rate of interest at which an independent business alternative is still attractive. For example, a businessman may decide 20% returns is minimum that the he expects from his business, Otherwise he may with draw. Here MARR is 20%.

Also known as the minimum attractive rate of return, MARR is the lower limit for investment acceptability set by organizations or individuals. It is a device designed to make the best possible use of a limited resource, for example money. Minimum acceptable rates of return very widely according to the type of organization and may even vary within the organization. For example, the rate return required for cost reduction proposals may be lower than that required for R&D Projects in which there is less certainty about prospective cash flows.

II. Internal Rate of Return

The Internal Rate of Return is nothing but the rate of interest *i* at which all costs of a business is equal to all its revenues. In other words, IRR represents the rate of interest at which all outflows equals all inflows in a cash flow diagram. This basically means that for a given CFD there exists a value of i at which there is no loss or no profit, which is nothing but IRR. Internal Rate of Return is also known as *Time-Rate of Return*.

In order to find the IRR of a CFD we have to equate the PW or FW or AE of its revenues with the PW or FW or AE of its costs respectively. In this chapter, Present Worths have been equated, although the students could use FW or AE too.

i.e. PW(Revenues) = PW(Costs)

PW(Revenues) – PW(Costs) = 0

In a given problem which asks for IRR to be found, all values of costs and revenues would be given along with service life. We may make use of compound interest formulae or tables in order to solve for *i*, which is done by trial and error. Interpolation is normally used to get the value of *i*.

III. EXTERNAL RATE OF RETURN (ERR)

This is rate of interest external to a project at which net cash flows generated by a project over its life can be reinvested. In other words, ERR represents that rate of interest available outside the project in the real world such that it becomes attractive to withdraw revenues from the business and invest it elsewhere to enjoy higher returns. In principle, it is not fair, but it exists as an economic option, because it does not make sense to continue with a business alternative which earns less, than a possible investment outside. Usually ERR would be equated to MARR, so that money invested in business is acceptable. In other words, a businessman would not withdraw his money if the returns from the project is at least equal to ERR which would be then called MARR.

Following are the general steps to find IRR using PW values

Step 1: Since *i* is not given, assume *i*. Let the value of i be a low value, say 5%. Find the PW of the alternative taking i = 5%. At lower values of i, PW is usually +ve.

Step 2: Assume a higher value of i say 10%. Find the PW of the alternative. If PW value is –ve, then stop. Else, assume a even higher value of i, say 15% and then find PW again. Repeat this until PW is –ve.

Step 3: We now have a value of *i* at which PW is +ve and another value of *i* at which PW is –ve. By interpolation we can therefore find the value of i at which PW = 0. This *i* is nothing but the internal rate of return.

P.S: Please note that i_{IRR} obtained this way is approximate because of the very nature of interpolation. A more accurate value of i_{IRR} can be obtained if the difference between *i* (+Ve) and *i* (–Ve) value is as low as possible, while carrying out interpolation.

Also please note that i_{IRR} can be found only if a given CFD has both revenues and costs. If a CFD has only revenues or only costs, i_{IRR} cannot be found. This is because for any given *i*, the net PW would always remain either +ve or –ve respectively, never becoming zero.

COST-OF-CAPITAL CONCEPTS

To run any business, capital is needed–both fixed and working capital. Capital pooled, for any reason, can often come from several sources having different rates of interest. The proportion of capital from different from sources obtained at different costs is represented by Weighted Cost–of–Capital. This can be calculated by the formula:

$$i_w = p_1 i_1 + p_2 i_2 + p_3 i_3 \ldots P_n i_n$$

Where i_w = Weighted cost of Capital

$i_1, i_2 \ldots i_n$ = Rates of interest for various sources of finances.

$p_1, p_2, \ldots p_n$ = Proportions of total capital from various sources.

Example : If a firms is financed from source X, Y, Z with rates of interest 7,9 and 11 percent and in proportions 20, 30, and 50 percent, respectively, then Weighted Cost of Capital.

$$i_w = 0.07\ (0.2) + 0.09\ (0.3) + 0.11(0.5)$$

$$i_w = 0.096$$

or $$i_w = 9.6\%$$

The cost of Capital is not a easy quantity to estimate despite the apparent simplicity of the formula. When sources of finance is from bonds, stocks, banks, depreciation funds, unpaid taxes, bank overdrafts, hand loans, profits re–invested etc., it becomes troublesome to determine proportions and rates of interests.

The weighted cost of Capital is used to determine minimum acceptable rate of return (MARR) of business alternatives. However, the actual rate of return expected from new investments is normally greater than Weighted cost of capital. In other words, the over-riding criterion of any business is to see that the actual rate of return is comfortably higher than a well–estimated weighted cost of capital. If not, it is better to invest capital elsewhere to get a higher return!

In a business organization, the cost of capital is seldom determined by the engineering economist. It will be determined by the Chief Financial Officer (or someone reporting to the CEO) in conjunction with the accounting department.

Example

A fresh mechanical engineer wants to become an entrepreneur. He starts a (CAD) Centre to give design solutions to small–scale industries. He expects that his software and business would last for 5 years. The initial outlay and cash flow pattern for the new business are as listed below. Find the Internal rate of return for the new business if he estimates a salvage value of Rs. 1,00,000 at the end of 5 years.

Period	0	1	2	3	4	5
Cash flow	–700000	180000	190000	210000	225000	200000

Given,

Initial Investment, P = Rs.7,00,000 ⟶ Cost

Revenues for years 1 to 5, R_1 = Rs.1,80,000
R_2 = Rs.1,90,000
R_3 = Rs.2,10,000 } Revenues
R_4 = Rs.2,25,000
R_5 = Rs.2,00,000

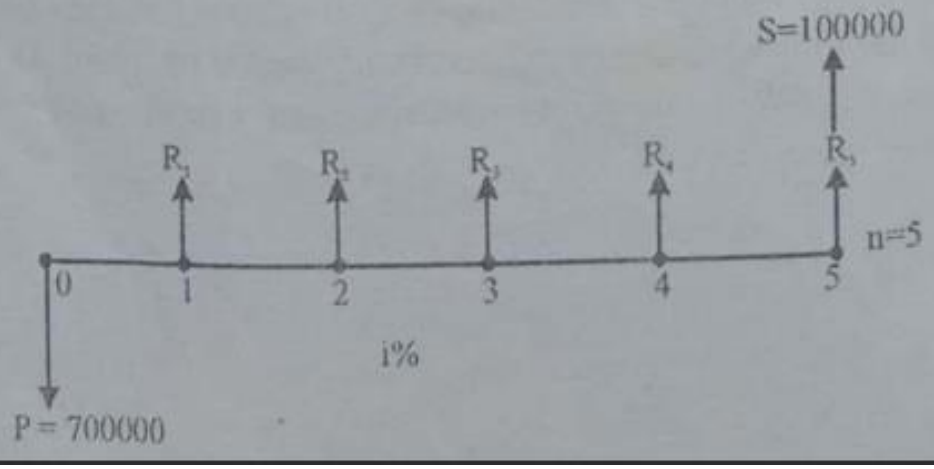
Salvage value, S = 1,00,000

Life of business, n = 5 years

Present worth, PW = ?

Internal rate of return, i = ?

CFD for the above problem would be



Step 1: Assume a low value for i say i = 5% and find PW

$$PW(\text{at } i = 5\%) = PW(\text{Revenues}) - PW(\text{Costs})$$

$$= R_1(P/F, i, n) + R_2(P/F, i, n) + R_3(P/F, i, n) + R_4(P/F, i, n) + R_5(P/F, i, n) + S(P/F, i, n) - P$$

$$= 1,80,000(P/F, 5\%, 1) + 1,90,000(P/F, 5\%, 2) + 2,10,000\,(P/F, 5\%, 3) + 2,25,000(P/F, 5\%, 4) + 2,00,000(P/F, 5\%, 5) + 1,00,000\,(P/F, 5\%, 5) - 7,00,000$$

$$= 1,80,000(0.9524) + 1,90,000(0.9070) + 2,10,000(0.8638) + 2,25,00(0.8227) + 2,00,000(0.7835) + 1,00,000(0.7835) - 7,00,000$$

$$PW(\text{at } i = 5\%) = \text{Rs.}2,45,317$$

Step 2: Now, let i = 10% and find the PW

$$PW(\text{at } i = 10\%) = PW(\text{Revenue}) - PW(\text{Costs})$$

$$= 1,80,000(P/F, 10\%, 1) + 1,90,000(P/F, 10\%, 2) + 2,10,000\,(P/F, 10\%, 3) + 2,25,000(P/F, 10\%,4) + 2,00,000\,(P/F, 10\%, 5) + 1,00,000(P/F, 10\%,5) - 7,00,000$$

$$PW(\text{at } i = 10\%) = \text{Rs.}1,18,372$$

Step 3: Since PW is still +ve, increase value of i say i = 15% and find PW

$$PW(\text{at } i = 15\%) = 1,80,000(0.8696) + 1,90,000(0.7561) + 2,10.000(0.6575) + 2,25,000(0.5718) + 2,00,000(0.4972) + 1,00,000(0.4972) - 7,00,000$$

$$PW(\text{at } i = 15\%) = \text{Rs.}16,077.$$

Step 4: Since PW is again slightly +ve, assume i = 18% and find PW

$$PW(\text{at } i = 18\%) = 1,80,000(0.8475) + 1,90,000(0.7182) + 2,10,000(0.6086) + 2,25,000(0.5158) + 2,00,000(0.4371) + 1,00,000(0.4371) - 7,00,000$$

$$PW(\text{at } i = 18\%) = \text{Rs.} - 35,947.$$

Step 5: Therefore, we have, PW = 16,077 when i = 15% and

PW = – 35,947 when i = 18%

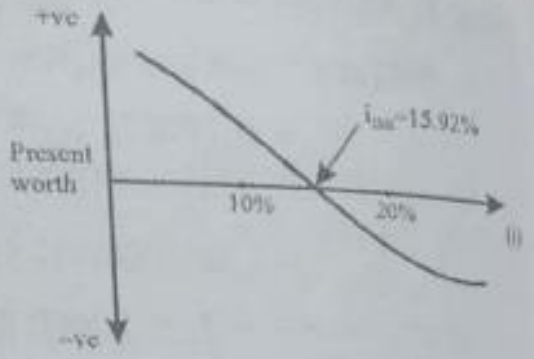
Therefore we can find i at which PW = 0 by interpolation

$$\therefore i_{IRR} = i_{(PW+Ve)} + \frac{PW(+Ve) - 0}{PW(+Ve) - PW(-Ve)} \times \text{increment in i from +Ve to –Ve}$$

$$i_{IRR} = 0.15 + \left[\frac{16,077 - 0}{16,077 - (-35,947)} \times (0.18 - 0.15)\right]$$

$$i_{IRR} = 0.1592$$

or



$i_{IRR} = 15.92\%$ → This is the internal Rate of Return.

An IRR of 15.92% means that PW has +Ve value until this particular rate of interest and then becomes –Ve beyond this value.

This again means that the Present Worth of all revenues is equal to PW of costs at this value of interest rate. We can also infer here that if the mechanical engineer in this problem borrows Rs.7,00,000 from the bank, at less than 15.92% rate of interest, he will be making profit. If he has to pay a higher rate of interest than that, he would be under loss. Therefore 15.92% represents the rate at which he makes no loss–no profit, for the given cash flow diagram.

Verification

We can verify whether 15.92% is really the internal rate of return by substituting i = 15.92% and finding PW. But please note here that tables cannot be used and hence we use formula)

$$\therefore PW(\text{at } i = 15.92\%) = PW(\text{Revenues}) - PW(\text{Costs})$$

$$= R_1\left[\frac{1}{(1+i)^n}\right] + R_2\left[\frac{1}{(1+i)^n}\right] + R_3\left[\frac{1}{(1+i)^n}\right] + R_4\left[\frac{1}{(1+i)^n}\right]$$

$$+ R_5\left[\frac{1}{(1+i)^n}\right] + S\left[\frac{1}{(1+i)^n}\right] - P$$

$$= \frac{1,80,000}{(1+0.1592)^1} + \frac{1,90,000}{(1+0.1592)^2} + \frac{2,10,000}{(1+0.1592)^3}$$

$$+ \frac{2,25,000}{(1+0.1592)^4} + \frac{2,00,000}{(1+0.1592)^5} + \frac{2,00,000}{(1+0.1592)^5} - 7,00,000$$

$$PW(\text{at } i = 15.92\%) = -571 \approx 0$$

This is permissible as deviation given the high values in the CFD.

Introduction

Depreciation basically means a decrease in worth. It is nothing but the reduction in value of any physical asset with the passage of time. Depreciation is the opposite of Appreciation. Except for some commodities like real estate, art objects etc., whose value appreciates with time, all physical resources that we come across loses its value with time. This is because equipment may wear and tear or become obsolete with respect to technology or with time, which all reduces its value.

In business, depreciation of all equipment is calculated and considered as operating costs, which will also help reduce taxes. Strictly speaking, if an amount equal to depreciated value of any equipment is saved every year, the sum total could be used in future to buy new equipment, when old equipment becomes useless. This is the use and importance of calculating depreciation.

In any industry, new machinery needs to be bought continuously to replace old ones, and this requires money. This money has to be generated from the earnings of the old equipment. Money which is set aside from the earnings of an equipment for its replacement purpose is called **Depreciation Fund**. But seldom is a depreciation fund actually established to accumulate money earmarked for the replacement of any specific asset. Instead, **Depreciation Reserves**, are used to fund proposals to improve operations, by way of replacing worn-out equipment or by way of improving working conditions to improve life of assets. Recovered capital is thus reinvested in a general way to maintain the company's physical resources and to pursue new ventures.

Cause of Depreciation

Assets may depreciate in value for several reasons. Their decreasing worth may be attributed to any of the following reasons:

1. Physical Depreciation

The everyday wear and tear of operation gradually reduces the physical ability of any equipment to perform its intended function. A good maintenance program may probably improve the life of the equipment, but they can seldom be compared to new machines. In addition to normal wear, accidental physical damage can impair ability. Wear and tear is an obvious addition to cost of production.

2. Functional Depreciation

Performance of may equipment continuously decreases with time, unable to meet the demand. In other words, demands made on an asset may increase beyond its capacity to produce. At the other extreme, the demand for services may cease to exist. In other words, a machine may be producing a product well but the product may well be no longer in demand.

3. Technological Depreciation

Development of new machines and process may render the current ones uneconomical. This is especially true in the present world with respect to telecommunication products, software, electronic goods etc... Along with machines, the technology associated with them also depreciates.

4. Sudden Failure

This refers to sudden or catastrophic loss in value of an equipment due to the presence of inherent technological flaws. However, this does not include loss due to accident or misuse. Light bulbs burn out as a natural consequence of regular use and with little loss in its brightness up to the point of failure. Generally, this category of assets include items used in large numbers with a relatively low unit cost.

5. Depletion

Consumption of an exhaustible natural resource like petroleum, coal etc., continuously leads to a depletion of sources. This can reduce the worth of sites from where thses sources are exploited. In other words, depletion of natural resources leads to a reduction in earnings derived from the resources

6. Monetary Depreciations

Depreciation calculations always consider original prices of assets. But these prices can vary because of inflation and other market forces, which can make replacements worrisome. If prices rise during the life of an asset, then a comparable replacement becomes more expensive. This means that depreciation fund set aside will be insufficient to provide an adequate substitute for the worn-out machine. It also suggests that the selling price of the product being produced by the machine does not accurately reflect the cost of production. Because the depreciation is actually happening to the invested capital representing the equipment, instead of the equipment itself, monetary depreciation is very difficult to accommodate. Monetary depreciation cannot be even considered as operating expense for tax benefits.

B_4 = Rs.121.90

TAX CONCEPTS

A tax is a compulsory contribution levied on an individual or a corporation by the Government of a country without any reference to any benefit. The aim of taxation is to raise funds to build infrastructure, to defend the country from enemies, to prohibit or regulate certain activities, and for social equalization.

Kinds of Taxes : Taxes may be direct or indirect.

A **Direct Tax** is a tax, the burden of which is mainly borne by the person on whom it is imposed. The income tax, inheritance tax, property tax are direct taxes.

An **Indirect Tax** is a tax, the burden of which is passed on by the person on whom it is imposed, to others. Indirect taxes are generally levied on commodities. The customs, sales tax, and the excise duties etc., are indirect taxes.

Following are the principle types of taxes and their relevance to engineering economic studies:

1. **Property Taxes :** These are charged by state Governments on land, buildings, machinery and equipment, inventory etc.. The amount of tax is dependent on the estimated value of assets and the prevalent tax rate. Property taxes are usually not

a significant factor in an engineering economics study because of their small magnitude compared with income taxes and their similar effect on competing proposals.

2. **Excise Taxes :** These are imposed on the production of certain products such as tobacco and school. These do not have a big effect on engineering and its economics.

3. **Sales Tax :** Whenever a commodity exchanges hands, money is paid and a bill is raised, sales tax comes into the picture. This plays a major role in engineering economics.

4. **Value-added Tax (VAT) :** Value-added tax is tax levied on a company only on the value addition that it does. In other words, for a company producing any product, tax calculated is on the difference of value of outgoing product and the value of incoming material. A company is liable to be taxed only on the portion of the value that it adds to the product.

   Value-added tax depends on both costs and profits, and not on profits alone. VAT provides incentives for higher efficiencies of companies and encourages reduction of wasteful expenditures. But VAT is also considered inflationary and regressive with respect to income.

5. **Income Taxes :** This is imposed on personal and corporate incomes. Income tax rates are usually higher for higher incomes. They are based on net income after deductions deduction allowed for permissible expenses.

The following chart shows the sources of national income of India during 2004-2005:

Fig. Sources of Indian National Income

CORPORATE INCOME TAX

Just like individual, companies are subjected to income tax. This is known as Corporate Income Tax which is imposed on the net profits of the company.

Corporate Tax is payable by all forms of business associations, joint-stock companies, insurance companies, and trusts and partnerships that operates as corporations. Organizations of doctors, lawyers, engineers and other professionals are generally recognized as corporations. Such organization have the following characteristics :

1. Organized association to carry on business.
2. Profits from business that are divided.
3. Continuity of life and centralized management.
4. Limited liability and free transferability of interests.

Corporate tax in India is imposed on the net profits made by the company. Generally net profits are obtained by deducting all kinds of expenses, interest on debts, depreciation and so on from Gross income.

Taxable Income = Gross Income – (Deduction)

Taxable Income = Gross Income – expenses – interest on debt – depreciation – other allowable deductions.

Gross Income: Includes revenues from sale of goods and services to customers; dividends received on stocks; interest from loans and securities; rents, royalties and other gains from ownership of capital or property.

Expenses: Include wages, salaries, rents, repairs, taxes, materials, employee benefits, advertising etc.

Interest: Interest paid on debts and borrowings are also deductible from taxable income. When interest is paid on a loan borrowed to buy a house, the interest payable is deducted from taxable income.

Depreciation: It is the cost equivalent of reduction in the worth of machinery and equipment, which is also deducted from taxable income.

Other deductions: Include many other provisions such as losses from fire theft, insurances paid R & D expenditures, pollution control expenditures etc.

There are many ways in which corporate taxes in India are levied in the from of surtax, Penal tax, Capital Gains tax, Commodity tax, tax on capital stock, income tax, tax on excess profits, tax on undistributed profits, value-added-tax etc.